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LENGTHENING OF HUMAN LIFE IN RETROSPECT AND PROSPECT*

IRVING FISHER, FELLOW, A.P.H.A.

Professor of Economics, Yale University, New Haven, Connecticut

AT ITS Cleveland Meeting in 1922, the American Public Health Association adopted a long resolution, prompted by the death, at the age of ninety-nine, of Dr. Stephen Smith, one of its founders. I quote from this resolution:

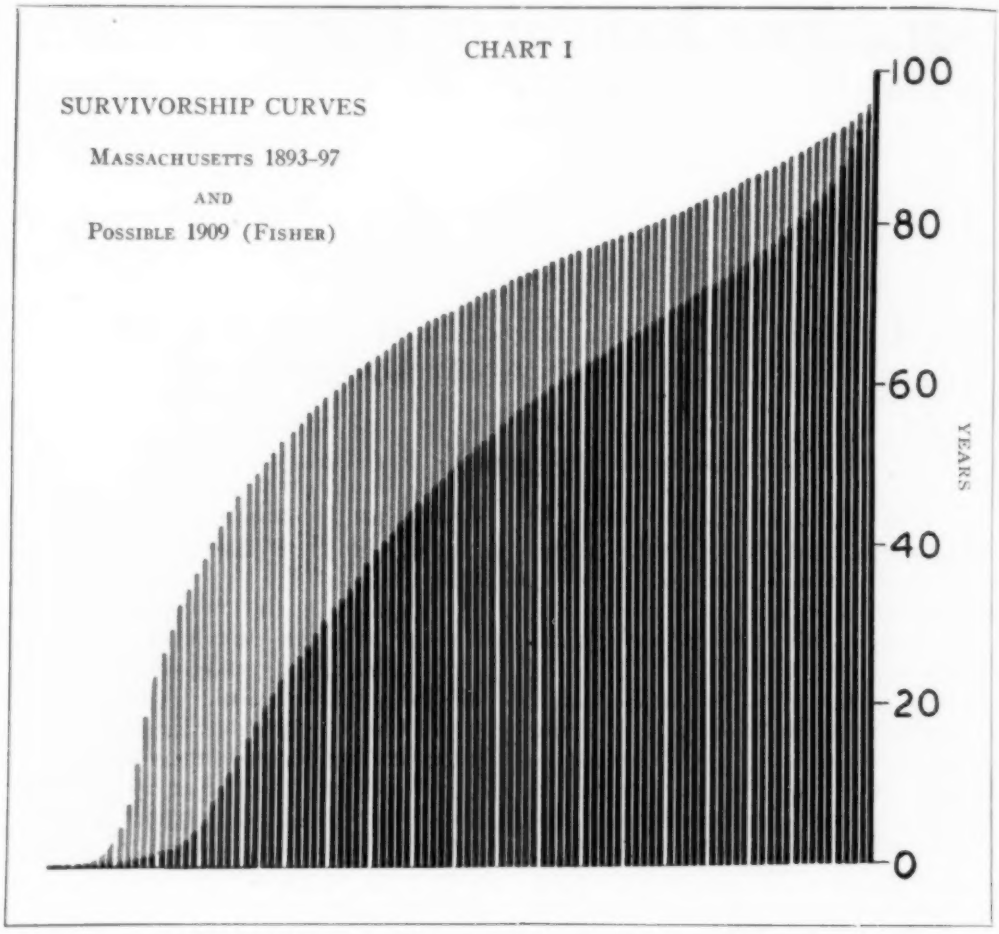
". . . his [Dr. Stephen Smith's] last request and advice to this Association a year ago was: . . . 'To send messengers of hope in a new scientific standard of long life. . . .' In New Zealand they have all but attained, for their people, an average length of life of sixty-five years, and this is ten years more than we reached in the Registration states of the United States in 1920. . . . We, the health workers of our communities, are confident that there is nothing inherently impracticable or extravagant in the proposal we make that many nations may attain such knowledge of the laws of health, appropriate to each age and occupation, to each climate and race, that within the next fifty years as much as twenty years may be added to the expectancy of life which now prevails throughout the United States, and to this goal we dedicate the efforts of our Association as urged by our departed leader, Stephen Smith."

So far as in me lies, I wish to further the objects of this resolution.

First, let me confess that my own studies in health, which may seem a little outside the range of my profession, were first stimulated by my having had tuberculosis twenty-seven years ago. From this personal interest I was gradually led to see the great economic importance of health and to appreciate Emerson's dictum that "the first wealth is health."

In 1908 I was made a member of President Roosevelt's Conservation Commission for the express purpose of adding to its study of the economic conservation of forests, minerals, soils and waters, that of human life. In my *Report on National Vitality*, published by the National Conservation Commission in 1909 I utilized all the expert opinion and data then available, as to the preventability of various diseases, in order to reach a conservative estimate of possible life extension. For instance, it was estimated that deaths from tuberculosis could be prevented by 75 per cent, thereby adding 2.5 years to human life; those from diarrhea and enteritis, 60 per cent, adding 2.3 years; erysipelas, 30 per cent, adding 0.9 years; acute nephritis, 45 per cent, adding 0.9 years; typhoid fever, 85 per cent, adding 0.6 years; diphtheria, 70 per cent, adding 0.5 years. Cancer was set down with a zero preventability, and diabetes was set down with only a 10 per cent preventability.

* Read at the Second General Session of the American Public Health Association at the Fifty-fifth Annual Meeting at Buffalo, N. Y., October 13, 1926.



Showing distribution of an average group of one hundred human beings arranged by the number of years each person lived, and also showing graphically these years. The one hundred vertical bars in this chart represent one hundred persons in a representative group. The height of the bars shows the number of years of life enjoyed by each person. The black bars portray conditions in Massachusetts in the 90's and the gray portion added to each of these black bars shows how many additional years of life each person was entitled to, according to Professor Fisher's estimate, made in 1909, and what would be the possible improvement which could be expected.

Chart II shows that Professor Fisher's estimate had already been nearly reached throughout the United States Registration Area by 1917.

The chief net results[1] were that, by preventing diseases of infancy, at least 4.4 years could be added to the average duration of life; by preventing diseases of middle life (diseases having a median death incidence between the ages of 23 and 49), at least 6.8 years could be added, and that the total prolongation of life which would come from applying all the preventabilities was about 15 years. B. H. Forsyth by more refined methods obtained 13 years.[26] Chart I shows the Survivorship Curve (for Massachusetts, 1893–97) the latest available in 1909, and what was claimed in 1909 as possible.

SOME HOPES REALIZED

These figures took no account of future advances in preventive science. They signified merely what could be attained by applying knowledge existing in 1908. This forecast of 15 years to be added to the human lease of life, though extremely conservative, seemed preposterous to many, when published, just as to-day the Stephen Smith resolution setting a goal

of 20 years seems to many quite preposterous. It is, therefore, interesting to note that, in the 17 short years since the *Report on National Vitality* was published, most of the preventabilities then estimated as possible have already been realized, and that almost all of the 15 years calculated as attainable have actually been attained.

Thus, Dublin tells us in 1922 that, since 1911, tuberculosis has declined 50 per cent among those insured in the Metropolitan Life Insurance Company and almost as much in the general population of a number of progressive cities; this 50 per cent already attained is two-thirds of the preventability set down for tuberculosis in 1909. That the remaining third is easily attainable is indicated by the Tuberculosis Demonstration in Framingham, Massachusetts, conducted by the Metropolitan Life Insurance Company. There the death rate fell 69 per cent in only 7 years; this is almost the total 75 per cent preventability set down in 1909.

Typhoid fever has declined 87½ per cent as against the 85 per cent set down as possible in 1909. Diphtheria has declined 44 per cent as against the 70 per cent set down, and now we know that diphtheria can be practically wiped out. It was recently announced by the American Museum of Safety that "twenty years of accident prevention in the plants of the United States Steel Corporation had resulted in a reduction of more than 60 per cent in fatal accidents and in a reduction of more than 80 per cent in less serious injuries to workmen"; in my 1909 report only 35 per cent was set down as the preventability of deaths by violence. On the other hand, the coming of the automobile has greatly increased the number of street accidents. Automobile accidents rose from 8 per million of population in 1908, to 149 in 1923. Consequently, deaths from violence (now called "external causes") of all sorts in the United States have fallen only 18 per cent.

Turning to diarrhea and enteritis, the census shows a decrease of 66 per cent while, as Dr. Dublin points out, the death rates in 23 American cities have declined by 79 per cent; both of these are more than the 60 per cent set down. In fact, as Dublin also points out, the whole infant mortality rate has been already cut 60 per cent; only 47 per cent was set down. The death rate of children at ages one to four years has already declined 50 per cent; 67 per cent was set down (for diseases of children having a median-death age from 2 to 8).

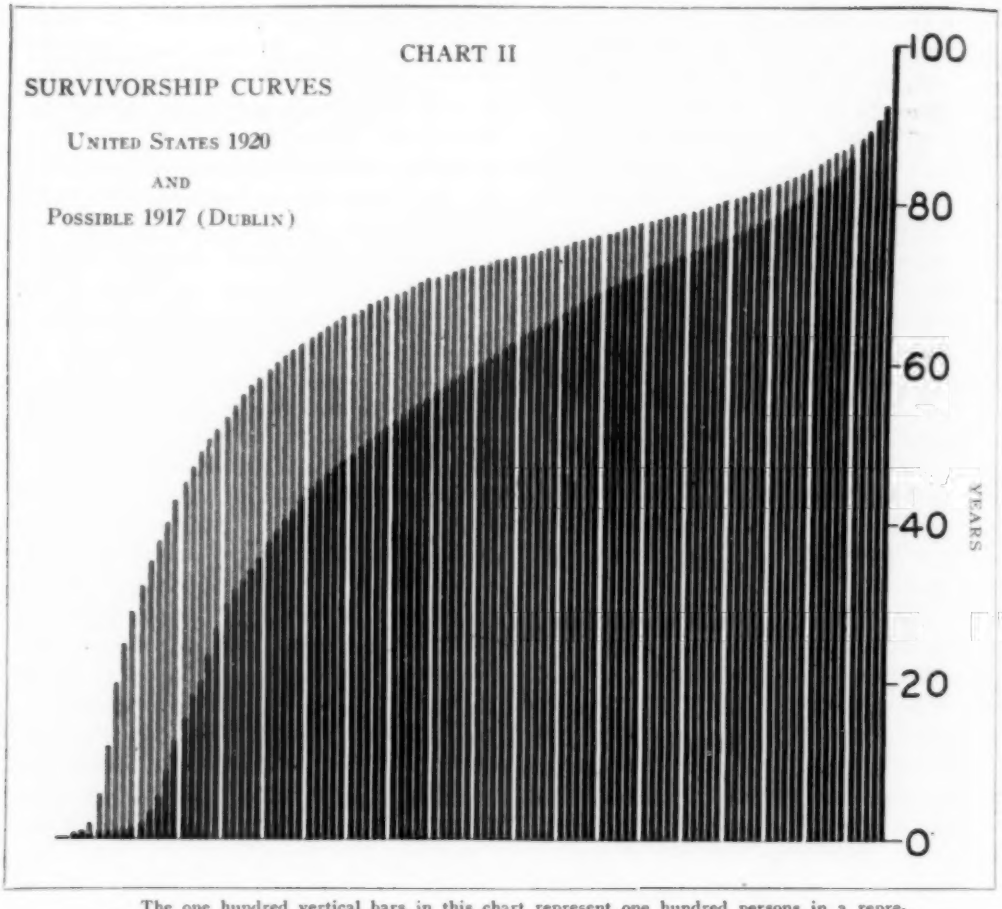
The mortality among graduates of women's colleges where medical inspection, supervision and instruction have been used is less than one-third that of the general population,[3] showing that the ordinary mortality of youth is two-thirds preventable. At the University of Wisconsin[4] as the result of medical supervision supplied by the state to students, it was found that "the loss of time due to bed illness has been reduced 40 to 60 per cent, due to the early treatment of preventable conditions. The frequent consultations have reduced serious illness and its complications by at least 50 per cent. During the 8 years of this medical supervision the university death rate has been reduced to only one-fourth of the general expectant rate, exclusive of tuberculosis."

FUTURE POSSIBILITIES

All these facts show how readily illness and disease will yield to preventive measures and that the forecasts made in 1909 were more than justified.

In 1922 Dublin published an independent forecast in his *Possibility of Extending Human Life*,[5] reviewing the more recent and reliable data, and showing that 10 years can still be added to human life by applying existing knowledge alone, without taking account of future discoveries or improvements in habits of living. Chart II shows the Survivorship Curve (for U. S., 1920) and Dublin's claim of what is possible.

The reason Dublin left out the effects of changes in habits and in the advance of hygienic science was merely because, for



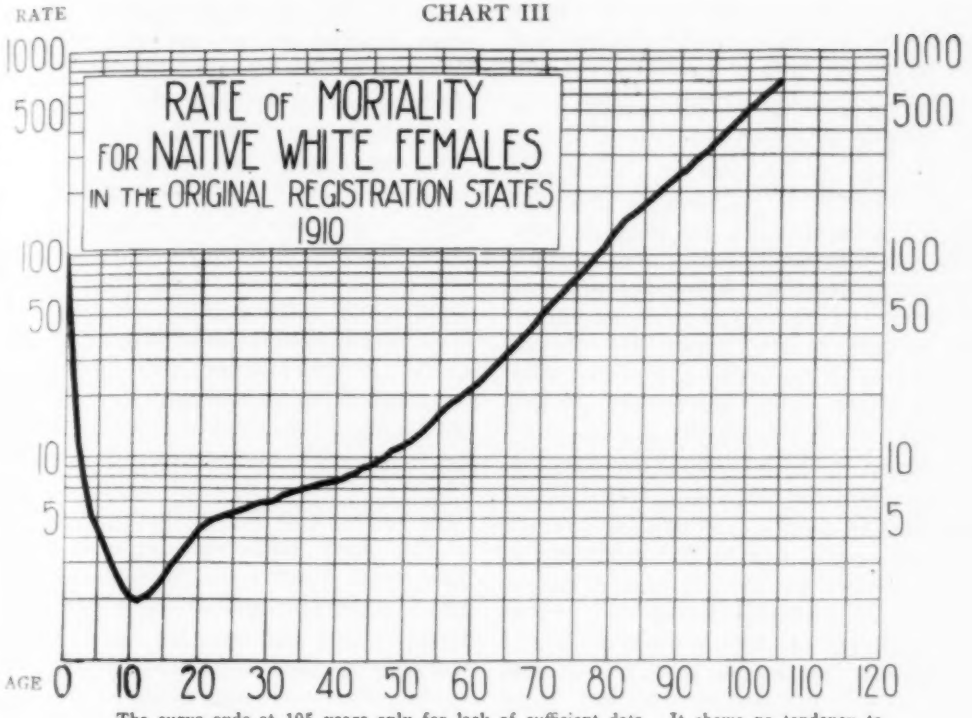
The one hundred vertical bars in this chart represent one hundred persons in a representative group. The height of the bars shows the number of years of life enjoyed by each person. The black vertical bars in this chart portray conditions in the United States, throughout the registration area, in 1920, and the gray tops above the black bars show what additional lifetimes might be expected, as a reasonable human goal, according to the estimates made by Louis I. Dublin, as early as 1917.

It will be seen that a marked increase has taken place in the length of the average lifetime in the last quarter century by comparing the black bars in this chart with the black bars in Chart I, showing conditions in Massachusetts in the 90's.

these two factors, he had no positive data and not because he thought hygienic science would henceforth stand still, or human habits either.

There is no way of accurately estimating the effect of these two factors—new discoveries and changing habits. But we have something to go by in the rates at which life has been lengthening in the past. Chart III shows the chief results of studies in past longevity. As I pointed out in 1909,[4] during the Seventeenth and Eighteenth Centuries in Europe human life was lengthening at the rate of about 4 years per century. During the first three-fourths of the Nineteenth Century, the rate was 9 years per century. During the last quarter it was 14 years per century in Massachusetts, 17 years per century in Europe in general, and 27 years per century in Prussia in particular. More recent data show that, in the first quarter of the Twentieth Century, for the United States, England and Germany, life lengthened at the amazing pace of 40 years per century. Raymond Pearl finds that Baltimore, during the last half century, has been lengthening human life at the rate of 30 years per century; while London shows a rate of 45 years per century. But it is

CHART III



The curve ends at 105 years only for lack of sufficient data. It shows no tendency to approach a limit, *i.e.*, a vertical direction.

Germany which again reaches high water mark with a rate of 60 years per century!

But are these rates destined to keep up or are they, like the speed of 60 miles an hour which an automobile reaches for a brief moment, destined soon to recede? Dr. Hornell Hart of Bryn Mawr College[7] believes that not only will the present rate be kept up, but even that its recent acceleration will be maintained. He concludes that, by the year 2000 the average duration of human life will be 100 years and that many babies will then be born destined to live to be 200. In support of this startling prognosis, Dr. Hart says:

> The tendency for the past million years has been toward accelerating increases in man's power to control his environment. This is conclusively shown by the study of the cutting tools used by man from the Pliocene age, hundreds of thousands of years ago, up to 1925. In a more definitely measurable way this acceleration is obvious in such variables as the speed with which man has been able to move, the rapidity with which he has been able to make copies of a message, the length of the span over which he could throw an arch or bridge, the speed with which new inventions have been diffused over the world, and the distance at which one man could kill another. Curves drawn to represent any one of these accelerating developments will suggest the same upward sweep which is evident in the line representing gains in expectation of life.
>
> Instead of showing signs of having used up the major possibilities in preventive medicine, research in this field is making major new discoveries which bid fair to eclipse past attainments in life saving. The discoveries relating to internal secretions and to the functions of vitamins are just beginning to be exploited. Antiseptics many times as powerful as any in past use have very recently been discovered. Important progress is being made in relation to cancer and diseases of the heart and blood vessels—two of the most serious causes of death in later life. The potential immortality of the cells of the body has been demonstrated. Not only are such discoveries being announced with increasing frequency, but new research laboratories are constantly being opened; new apparatus and new technics are being discovered and brought into use; an increasing number of

trained investigators is available and unprecedented funds are being placed at the service of scientists in this field.

But, plausible as this all sounds, if we are seeking to extend the figures of past experience, we hesitate to follow Dr. Hart's method. He virtually assumes that the curve representing the average duration of life at successive future dates is a parabola ascending continually and with increasing speed, and takes no account of any possible limit to human life. But, if this parabolic law really holds, why stop, as Hart does, at the year 2000? At that time the rate of life lengthening would be, Dr. Hart finds, 80 years per century. Allowing for the same acceleration as before, within another century the average life time would exceed 200 years and in a few more centuries, it would exceed Methuselah's alleged record. After that we would have to measure human life in thousands of years, tens of thousands and ultimately in millions or trillions! Even the wildest imagination must shrink from such extravagant hopes.

I think we can discuss the question best by dividing it into two:

1. If there exists a natural limit to human life of, say, 100 years, how far may we expect to increase the duration of life?
2. How far, if at all, may we extend the alleged natural limit of 100 years?

If, as has commonly been supposed, a natural life cycle exists and the extreme life span is a part of that natural life cycle, the utmost we can hope to accomplish is to eliminate deaths occurring earlier than this natural limit, which deaths for the most part may be called premature. This is merely giving each individual a fair chance to fill out his natural life span by protecting him from accidents, disease germs, and so forth.

One hundred years is, for the sake of argument, taken as this alleged natural limit because it is conservative and because it is the limit often assumed by actuaries. They point out that few authentic cases are known in which this supposed limit has been exceeded. They point out that we have reduced the mortality in the earlier ages but not in the later, and that hitherto the chief life-lengthening has been of infants' lives. We have changed the shape of the survivorship curve but not its length of 100 years.

In England, in the middle of the last century, one-quarter of the people died before they were 5 years old. In the beginning of this century one-quarter died shortly before reaching 40. Using the same two dates we find that one-half died by the age 45 in the last century and by 65 in this, while three-fourths died before the age of 70 in the last century and a little after 75 in this. Thus the advance in this third quarter of life was only a little over 5 years as against 30 or 35 years in the first quarter. The nearer we reach the century mark the less improvement do we find. The century seems to round out man's age which very, very seldom runs into three figures.

If we assume this 100 years as the limit, we must substitute for Hart's parabolic law of progress an entirely different type of curve the specifications for which may be: (1) that we start off at the present average duration of life in the United States, 58 years, and with the present rate of life lengthening, 4½ years per decade; (2) that this average shall approach 100 years as a limit; and (3) that its rate of increase, relatively to the possible room for improvement still left, shall be maintained at 10 per cent, or about the present rate. The figure 58 years is that shown by Dublin to represent the average in the registration area in 1921, 1922 and 1923 in the bulletins of the Metropolitan Life Insurance Company.[24] The results of such a forecast are:

YEAR	FORECAST OF THE AVERAGE DURATION OF LIFE
1922	58 years
1930	61 years
1940	65 years
1950	69 years
1960	72 years
1970	75 years
1980	78 years
1990	80 years
2000	82 years

By the year 2100, the average duration of life would be 94 years; in another century it would be 98 years; in another, 99 years; and thereafter it would remain between 99 and 100, all the time approaching closer to the unattainable limit, 100 years.

According to this schedule, the average lifetime would reach Dublin's estimated increase at about 1940; would nearly reach our committee's quota of 20 years additional within the 50 years specified; and, by the year 2000 would reach the highly respectable figure of 82 years.

These results seem conservative; for certainly 100 years is a safe figure for the extreme limit of life and a progress every decade of 10 per cent of the room for improvement left seems, on the basis of past experience, a very safe figure. We ought to have considerable confidence that we shall actually beat this schedule and become a nation of octogenarians by the end of this century.

Before considering the second question (whether 100 years is the limit) we may dwell on how we may expect at least to keep up with the preceding schedule.

We can do this partly by nature's methods of acquiring immunity, as the Negro has acquired a natural resistance to hookworm, partly by consciously fighting germs, continuing the work begun by Pasteur; for, of course, the modern quickening of life extension begins with him. He said: "It is within the power of man to rid himself of every parasitic disease." We ought to be able to wipe the slate almost clean not only of typhus, yellow fever, and typhoid, but of diphtheria, tuberculosis and numerous other germ diseases.

The chief difficulty is not lack of knowledge but lack of its application.

APPLICATION BEHIND SCIENCE

Dr. William H. Welch says:

When a Koch discovers the tubercle bacilli, a Banting discovers insulin for the relief of diabetes, or a Von Behring an antitoxin for the cure of diphtheria, or a Park demonstrates the value of the toxin-antitoxin for the prevention of diphtheria, the world draws a long breath as if saying to itself, "Now we are rid of that terror which has haunted the human race for centuries." It then straightway forgets and goes on its way comfortably assuming that of course the great discovery, or invention, is being carried into effect.

The actual facts are quite different. A few people, those of unusual initiative, or ample means, or who happen to be under the care of exceptionally alert physicians, or within the jurisdiction of exceptionally competent health officers, receive the benefits of the new discoveries; but the great mass of the human race goes on as before, and the death rate from these diseases is reduced slowly and over long periods of time.

In fact, the health field has a woefully ineffective distribution service, as compared with the laboratories of the world. We know how to do a lot of things which we do not do, or do on a wretchedly small scale. Few of the great discoveries of preventive medicine, except the prevention of yellow fever, are anywhere nearly fully applied.

But we do not need to go for our illustrations to such definite discoveries as Von Behring's; even the common sense knowledge of exercise, sleep, fresh air and food is not yet well applied.

What science is really doing is rediscovering simple biological living. Civilization has brought bad sanitation; and now civilization, through its greatest product, science, is simply cleaning up its own mess.

The invention of window glass deprived man of the ultra-violet rays and shut out the air. The death penalty resulted through tuberculosis in millions of cases. Now we have found this out and seek sunlight, natural and artificial, and invent "vita glass" and "celo glass" to let the healthful rays in again. In such ways, man has upset the equilibrium of nature and needs to find scientific ways to restore the lost equilibrium.

Dr. Eugene L. Fisk and I have assembled many illustrations[2] of the unhygienic effects of such products of civilization as housing, clothing, cooking, softening our

food, and industrial conditions. The condition of civilized man's teeth compared with those in prehistoric skulls or of uncivilized tribes to-day affords an obvious illustration. Intestinal conditions afford a less well recognized illustration.

The task of applying hygiene naturally falls under three heads: (1) public hygiene, *i.e.*, hygiene through governmental health agencies; (2) semi-public hygiene, *i.e.*, hygiene through other institutions (this includes school hygiene, industrial hygiene and the hygiene of life insurance companies); and (3) individual hygiene, *i.e.*, hygiene through the voluntary effort of the individual.

PERODIC MEDICAL EXAMINATIONS

The first of these three is the particular job of the members of this Association. But their task is much larger than that. It should include an interest in the other two and especially the third.

The individual must be taught to practice individual hygiene. He can be stimulated to do so by periodic medical examinations. At the recent meeting of the American Medical Association at Dallas, the president, in his address, stressed this more than anything else. It has been advocated occasionally for over half a century.[24] Dr. Dobell[8] of England advocated it in 1860, Dr. Barès[9] of France in 1902, Dr. George M. Gould[10] advocated it in 1900. Dr. Burnside Foster advocated it in 1908 before the Association of Life Insurance Presidents, following my own address advocating life extension by life insurance companies. All of these authorities developed the idea independently, but it was not given any wide practical application until the establishment of the Life Extension Institute in 1914 when as the outgrowth of these efforts and of the coöperation of General William C. Gorgas, Ex-President Taft, Dr. Eugene L. Fisk and, most of all, Harold A. Ley, we founded the Life Extension Institute through which this ideal of periodic medical examinations has been made real. The chief objective was to harness up the profit making motive of the life insurance companies with the task of lengthening human life.

After six years' experience, during which the Metropolitan Life Insurance Company used the service, its statistical department, under Dr. Dublin, cast up accounts. The results were so astonishing that the actuarial department and the medical department refused to believe them, until forced to do so by going over the records for themselves. The three departments then united in a report showing that, as a consequence of expending $60,000 on medically examining 6,000 people within 6 years, the Metropolitan had gained, through premiums of people whose lives were extended, $120,000. In other words, this life insurance company had made 100 per cent on its investment.

This research was carried forward by Dublin to cover a total period of 9 years and showed an average reduction of 18 per cent in the death rate of the policy holders affected and, among a group of impaired lives a reduction of 50 per cent.[11] Thus was demonstrated the power of individual hygiene even when it was, as we know, only very imperfectly applied. After this record 44 other life insurance companies joined the service.

The Life Extension Institute has now examined 500,000 people, and stimulated the custom of periodical medical examinations among the medical profession. Perhaps its most important service consists in thus stimulating physicians to pay more attention to individual hygiene.[12] Any thorough examination will find defects, both in physical condition and in habits of living, among over 99 per cent of those examined. Any one who sets out to improve his health finds plenty of room for improvement. But to help him to secure this possible improvement, the medical profession needs higher standards of health. Physicians are trained to treat the sick; they must learn how to treat the so-called well.

In order to get any great results, the physician who preaches hygiene must also

practice what he preaches. To merely examine a man is not enough; the physician must have something educational to give, and he must take it seriously himself. The essence of improving health for the so-called well is improving habits. Habits are slow to change; yet only in this way shall we ever add greatly to the expectation of life at the later ages.

If by merely scratching the surface of individual hygiene the death rate can be reduced 18 per cent and for impaired lives, 53 per cent, what may we not expect if health ideals ever really take hold of our civilization? [14]

The favorable results of the Metropolitan Life statistics confirm, and are confirmed by, the similar statistics of the Guardian Life and the Postal Life. The Guardian Life finds an average reduction of 23 per cent in the death rate of the policy holders affected. The experience of the examinees shows that many with overweight corrected it before the next examination and that even such serious symptoms as albumin and sugar in the urine were checked.

It may be thought that the life insurance policy holders who take examinations are a self-selected group. To meet the objections a test is being made among industrial workers who are examined as a group,[25] and where self-selection is practically absent.

Professor A. H. Ryan,[15] of Tufts Medical School, working on such data taken from the Life Extension Institute has given exact statistical expression to the actual influence of the periodic health examination, in a paper not yet published.[7]

TABLE I

IMPROVEMENT IN PHYSICAL CONDITION OF INDUSTRIAL WORKERS RESULTING FROM PERIODIC PHYSICAL EXAMINATION AS REVEALED BY THE MEDICAL AND SURGICAL ATTENTION NEEDED AT 3 SUCCESSIVE YEARS OF EXAMINATION (596 INDIVIDUALS)

Class of Medical or Surgical Attention Needed	Number of of Cases Needing Attention at 1st Exam.	New Cases Needing Attention at 2nd Exam.	Percentage of Cases Cured Within Year Following Discovery of Impairment
General medicine..	90	60	69
Eye.....	217	66	52
Ear.....	64	24	58
Nose and throat...	144	79	50
Surgical	79	62	62

Summarizing the facts in Table I we find that within one year of the first examination a great reduction in the apparent need for medical treatment and correction of disabilities ranging from 50 per cent to 69 per cent in the various classes of disability was found, and there is no reason to doubt that these results are to be credited to the influence of periodic health examination, the counsel and suggestion based upon it, and the attentions of the family physicians to whom those needing medical treatment were referred.

Another interesting feature of Professor Ryan's study is the fact that, in an effort to ascertain the possible influence of focal infections, a study of about 8,000 examined cases showed that focal infection was so widely prevalent that it was impossible to secure a pure group of noninfected cases of a size adequate for comparison. This revelation of the extent of human impairments emphasizes the wide margin for possible improvement already stressed.

Both in England and in the United States, the World War disclosed unsuspected physical shortcomings.[13] General Pershing said the physical condition of a high percentage of young Americans was a disgrace to any nation.[13]

It is important that these lessons should not be missed by hygienists. They seem too often to be overlooked. Even Raymond Pearl, Professor of Biometry at Johns Hopkins University, in a popular article in *The American Mercury* seems to advise his readers against periodical medical examinations and exhorts them to "Live as a Christian Scientist is supposed to live, without thought or fear of disease. But *when you feel ill*, [the italics are mine] consult a physician at once."

The chief trouble with advice to wait until you *feel* ill is that, in many cases, a person does not "feel ill" until long after he has become ill. Who to-day would apply such advice to dentistry: "Wait till your tooth aches; until then do not bother to visit the dentist for examination." We

all know that the time to put teeth in order is when the cavity or focal infection begins, which is long before the teeth ache. The same is true of many far more vital organs than the teeth. Long ago Metchnikoff remarked that some of the worst diseases, such as diabetes, come upon their victims unfelt. The whole modern movement to check cancer is based on early examination long before the patient begins to "feel ill." The same is true of tuberculosis, intestinal toxemia and numerous other ailments.

One of the chief findings of the Life Extension Institute is the enormous extent of these unfelt ailments or, as Dr. Fisk calls them, "silent sickness." The same fallacy affects most sickness statistics. Such sickness statistics as in Sydenstricker's Survey,[16] can take no account of unfelt illness. For this reason they show a disproportionate amount of certain types of ailments as compared with the deaths for those ailments.

HABITS SLOW TO CHANGE

But the real obstacle to individual hygiene is the slowness of custom and habit to change. Experience with prohibition has shown that old habits and customs die hard, even when we set out to kill them by law, and know they ought to be killed.

In the case of lesser evils than alcohol, such as tobacco, tea, coffee, excessive meat eating, neglect of exercise, or of water drinking, or of elimination of body wastes, the scant use of sunlight and fresh air, the mental burdens of worry, phobias and manias, the difficulty of waking up the public is enormous. Many of us who have had tuberculosis are more than willing, for ourselves, to give up smoking, coffee drinking and other indulgences; and find that to give them up is not a sacrifice but an emancipation. But when we propose that the average man shall do likewise, we usually find that he cannot be stimulated to do so except, to a very minor degree, through periodical medical examinations. Probably it is only in this slow way that our health ideals will gradually be elevated very far. When that time comes most of us can approximate the limit of 100 years which has been discussed.

CAN WE EXCEED 100 YEARS?

Dare we go any further? Certainly yes, if we can see our way clear to pushing forward that 100 year limit, or alleged limit. But can this be done? Past experience, it is true, gives us little hope. There seems to be a fatal fascination about that round figure, the century mark. One actuary, formerly president of the American Actuarial Society, said that he saw no prospect whatever that this apparently fixed barrier would ever budge. T. E. Young, one time president of the British Institute of Actuaries, reached similar conclusions. In his book *On Centenarians*,[17] he found only 22 indisputable examples of centenarians with ages ranging to upwards of 105, although in a later edition he was able to increase the number to 30 and the limit to 111.

Most alleged cases are simply exaggerations, or errors. For instance, the Countess of Desmond is said to have lived 140 years, owing to a confusion of two persons of the same name, an earlier and a later countess. The 140 years was apparently the interval between the birth of the earlier and the death of the later.

Dublin, in his conservative forecast, does not allow for any improvement in mortality after the age of 70 years. In England, in the middle of the Eighteenth Century, the expectation of life after the age of 45 was rather better than to-day. Halley's life table for 1687–91 showed an expectation of life after age 80 greater than to-day's, although, as Pearl[18] points out, the data are too scanty to make the result significant.

In ancient Egypt, 2000 years ago, according to Karl Pearson, though the average life lasted only 30 years, after about age 68 the expectation of life was greater than ours owing, presumably, to natural selection.

When confronted with these stubborn facts, we must confess that the problem of extending the limit of human life beyond 100 years is not an easy one. But I believe the 100 year limit is a bogey which can, and some day will, be beaten.

There are five lines of evidence which, taken together, seem to be fairly conclusive that the possible life span of man is much more than the century which life insurance experience seems to indicate.

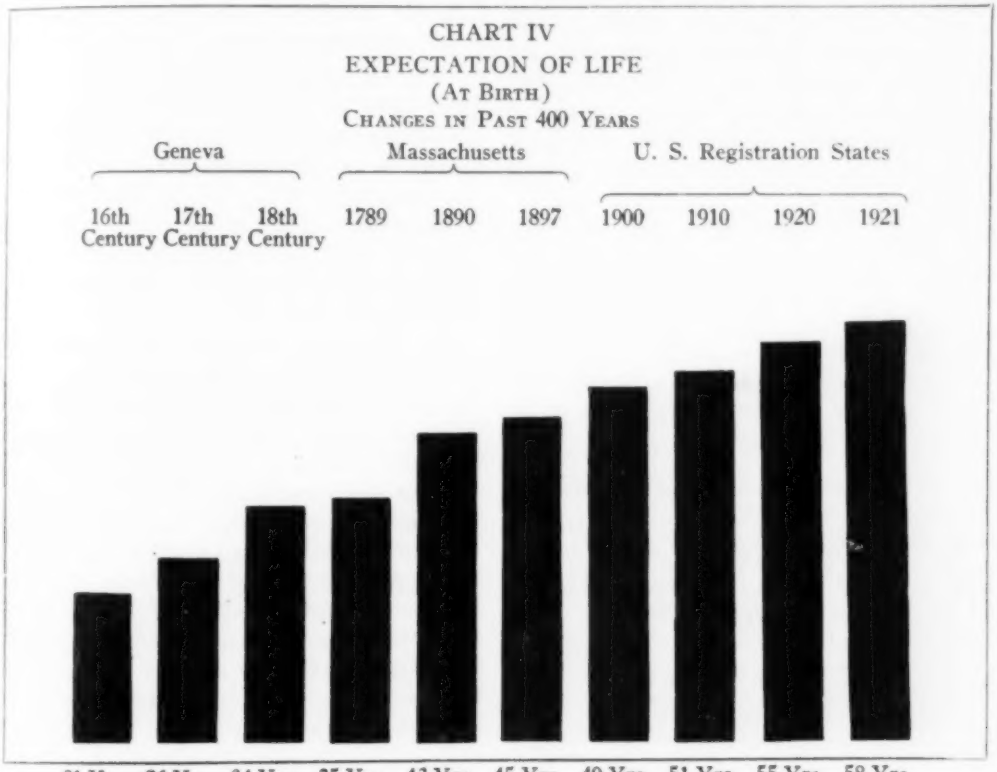
The studies of Westergaard for centenarians confirms this slowing down of the acceleration. He even found[20] in Norway that while nonogenarians had one chance in three of dying within a year, centenarians had only one chance in four. Now, if there exists any definite limit to human life the situation ought to be the reverse. The force of mortality ought to grow heavier and heavier and the curve representing it ought to bend, not toward the horizontal, but toward the vertical, approaching an impassable barrier or "asymptote." On the basis, therefore, of the only statistical evidence we possess, we find absolutely no hint of any definite limit to human life. On the contrary the right hand end of the curve hints the exact opposite.

CHART IV

EXPECTATION OF LIFE

(AT BIRTH)

CHANGES IN PAST 400 YEARS



Most of the Gain due to improvement in Death Rates under age 45

WHAT ACTUARIAL SCIENCE INDICATES

The first line of evidence is derived from the very tables on which actuaries rely, although it seems never to have been noted. If we examine the "force of mortality" year by year we find that, after the age of 60 years, while this mortality continues to increase, its *rate* of increase does not. Instead, it remains almost exactly constant until the age of 85, after which it actually decreases, especially for females. Chart IV shows this.

It is dangerous to extrapolate any statistical curve, for there is no telling which way it will turn; but if we assume that the mortality of centenarians is not over

50 per cent per annum, which is conservative so far as our scanty facts go, we would have at least one centenarian out of a thousand reaching 110 years and of those who reach 110, one out of a thousand reaching 120, and so on indefinitely. There would be one to reach 140 out of a trillion centenarians and one person would reach 180 out of a trillion trillion centenarians. Such a "law" of mortality does not seem unreasonable. Whether the chance of reaching 180 under this law is greater or less than the proverbial chance that a blindfold man could write Hamlet by setting type picked out by random, I do not know. I am not stressing the practical importance of such slim chances.

What I am stressing is that we must, apparently, give up the concept of any definite life span and substitute the concept merely of chance of survivorship which diminishes indefinitely but with no known or knowable limit. At any rate, this, and not a natural life span, is the lesson of actuarial science.

DELETERIOUS INFLUENCES REMOVED

The second line of evidence is that centenarians, like the rest of us, are invariably exposed to life-shortening influences. The removal of these influences ought therefore to lengthen their lives just as it lengthens others. I, myself, have collected 170 life histories of the very aged. On the average they lived much more hygienically than most people. But few of them were such paragons of virtue as Carnaro; while all, of course, had to battle with bacteria to some extent.

It stands to reason that if they had enjoyed a germ-free environment or had lived up to the very highest standards of hygiene, or both, that their lives would have been even longer than they were.

MORTALITY RATES DIMINISHING IN UPPER AGES

The third reason for thinking 100 years too small a limit is: recent experience clearly indicates that, contrary to prior experience, the mortality rates are beginning to diminish even at the upper age groups. The American actuary just referred to, admitted this and reminded me that I had predicted it in talking with him 20 years ago. Even at that time the same phenomenon had appeared in Sweden.

It stands to reason that the causes which are diminishing mortality at the higher ages will continue.

AUTHENTIC CASES OF LONG LIFE

The fourth reason for believing the 100 year limit too small is that life insurance experience and, still more, the larger experience of the census and of special investigators, like Westergaard, find a considerable number of apparently authentic cases of people who have lived 105 or even 110 years, and occasionally 120.

In Portland, Oregon, Mrs. Mary L. Wood died at the age of 120 years and under circumstances which permitted the authentication of her case by the Oregon Historical Society.

The extremest case with any good claim to authenticity is that, studied and accepted by Westergaard,[20] of the Norwegian Drakenberg who was born in 1626 and lived until 1772, aged 146. "He was married when 111 years old, and as a widower of 130 proposed to marry again, although without success."

It stands to reason that if a few people have actually passed the age of 120, in the future many more may do so.

LIFE CELLS IMMORTAL

The fifth reason for suspecting that our previous notions of a life limit are wrong is that modern biology finds the life cells and many tissues potentially immortal. This is perhaps the most sensational conclusion which science has ever reached. Yet, according to Pearl in his excellent book, *The Biology of Death*,[18] Loeb and Carrel and others have demonstrated its truth beyond reasonable doubt.

NO NATURAL DEATH FOUND

Woodruff of Yale found no natural death in a culture of Paramecium in 8,500 generations, equal to 250,000 years of human life, and the culture was going as well at the end as at the beginning. Morgan of Columbia found 1/250 of a worm (P. maculata) will regenerate and be "younger" than the original. Carrel has kept the cells of a chicken embryo's heart alive for many years by washing out the poisons generated in the life process and protecting against infection and food deficiency.

All of these studies are wonderfully suggestive for the future, although they are for the present far beyond the range of any practical application.

It would seem that biologists are gradually surrendering the idea of any natural death, or life span,[19] and reaching, instead, the idea that all death is accidental.

This change of view, if it comes about, will be revolutionary. Hitherto we have taken for granted a natural cycle of life with its various phases located at more or less definite intervals—birth, puberty, maturity, climacteric in females, and death—all spaced in a due relationship to each other. But when we attempt to put it in figures we find far less indication of a natural age for death than of the other milestones in life, such as puberty for instance. The age of puberty varies but little in any one species and the variation from the mode follows the usual frequency distribution. If mortality followed such a law it would center about some mode such as three score years and ten. But it does not do so very definitely.

Even Pearson, the greatest apostle of chance in biology, could find no such law except by superposing[21] five frequency distributions and Pearl[18] who, if anyone, should be sympathetic with Pearson's point of view, regards this as an artificial fitting of curves and not the interpretation of any fundamental biological tendencies. The frequency curve is realized to some extent for individual diseases and disease groups, as Arne Fisher has emphasized.

Metchnikoff[22] assumed that while today all deaths are accidental, whether due to the invasion of a bullet, a poison, or a germ, if we could safeguard against these we should reach a natural death at, say, 125 years of age.

INDEFINITE EXTENSION OF LIFE

But the present tendency is in the direction of assuming that all deaths are, always were, and always will be, accidental in nature and that by safeguarding against bullets, poisons, and germs we can theoretically extend life indefinitely. The picture we seem gradually to be forming is not the old picture of a life cycle which includes death but rather of a cycle ending in maturity (or, at most, the climacteric in women), just as the processes of making a watch end in its completion. After completion, the body may last until some one of its millions of parts suffers sufficient accidental injury to stop the whole machine, just as a watch may stop from a breaking of the main spring or a clogging with dirt. If this be the true picture, there is no normal natural lifetime for man any more than there is a normal lifetime for a watch. It is all a matter of having the man or watch well built to start with and well taken care of afterward.

It may be that a super-hygiene, a gland transplantation or other device or devices yet unknown will some day open up these new vistas so that Man may enter and take possession. The only obstacle seems to be his highly differentiated structure. There are so many parts to get out of order, the failure of any one of which reacts to cause the failure of all—that is death.

EUGENICS

But the lesson of this is that, with such a complicated and interdependent assemblage of organs, man's only chance of great longevity is to keep every single part of his machinery close to a 100 per cent efficiency. This can only be done by

hygiene carried to the *nth* power as well as by eugenics or "race hygiene."

Ordinary hygiene unaided by eugenics may break down. That is, ordinary hygiene is good for this generation, but threatens to be bad for succeeding generations by prolonging the lives of the unfit. And birth control, which some day may operate eugenically, is now operating dysgenically. The ultimate hope of mankind lies in eugenics. Alexander Graham Bell hoped the time would come when young men and girls who could boast of inherited longevity would be especially sought in marriage. Karl Pearson and Miss Beeton showed that inheritance does influence longevity. Alexander Graham Bell found that the average age at death of those whose parents both reached 80 was 52.7 while the average age of those whose parents died below the age of 60 was 32.8.

As Raymond Pearl [18] and Dr. Mazÿck P. Ravenel [23] say, in discussing this study of Bell's, the longevity of the parents of the first group added 20 years to their life as compared with the second group. They contrast this with my own estimate in 1909 of what hygiene can accomplish, and maintain that eugenics is much more important than hygiene as a means of lengthening the life of the race.

But changes in marriage selection can only slowly influence the length of human life. It can only operate generation by generation and is therefore a matter for future centuries. Meanwhile it is good to know that we can greatly help ourselves in our own generation through hygiene; and, as Stephen Smith said, "send messengers of hope in a new scientific standard of long life." We may also be spurred to try to emulate his own splendid example of living long and living right.

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RURAL MEDICAL AND HOSPITAL SERVICES*

W. S. RANKIN, M.D., Fellow A.P.H.A.
Director, Duke Endowment, Charlotte, North Carolina

THE MAJOR and kindred purposes of this paper are three: to direct attention to the shift of interest in the evolution of public health from the mass to man, from the common factor to the individual need; to consider the adequacy and availability of medical services for the general needs of the people; suggest a remedy for improving present condition of medical services.

THE EVOLUTION OF INTEREST

"When I was a child, I spake as a child, I understood as a child, I thought as a child: but when I became a man, I put away childish things." This Association is fifty-five years old. It has had a childhood, an adolescence, and is now in the strength and wisdom of maturity. Each of these three stages of development has been characterized by an evolution of its predominant interests.

In its infancy and childhood, its major interest, indeed its sole interest, was a vague, groping, and stumbling interest in environment in its possible relation to disease. So the weeds were cut, the trash hauled away and burned, the leaking sewer pipe mended, the miasma avoided, the home fumigated, and the open closet treated with lime. This childlike conception of health work is even now occasionally encountered as a vestigial interest in health departments that use the larger part of their budgets in garbage removal and measure their efficiency by the number of tons of garbage that have been hauled out of town.

In its adolescence, public health began to reason critically, to think more clearly, to define its objectives and to analyze its methods. This youthful and adventuresome interest tracked contagion to his lair and followed him through common factors to his victim. Epidemiology, scientific and exact, held the center of the stage. Public water supplies were provided, sewers were laid, the sanitary closet replaced the open back privy, milk supplies were regulated, anti-spitting ordinances were enacted and here and there enforced, and effective warfare was waged against the fly, the Anopheles, the stegomia, the louse, the flea and other insects. In many health departments, some of our very best, this epidemiological interest still dominates the picture and adjusts the budget, but even in such departments, a growing interest in the direction of a larger, more general and permanent field of service is clearly evident.

In its maturity, with the accumulated strength and wisdom of experience and observation, the predominant interest of public health has moved farther and farther away from environment and nearer and nearer to man himself. Having cleaned up his surroundings, having cut the trunk lines of morbific communication, having closed practically all avenues of infection except the unsuspected and undetected carrier, public health within recent years has sought to protect where it could not prevent. Prevention is public; protection is personal. So to-day, especially in the more advanced health departments, we find an increasingly larger part of the budget going into prenatal clinics, infant welfare clinics, medical inspection of schools, and periodic health examinations. We have come to a

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time when no modern health department can clear its responsibility by pleading a low death rate from communicable disease, but must accept responsibility not only for the death rate from specific infectious disease but for the general death rate as well. To carry this responsibility necessitates using every available means to the fullest possible extent in combating all morbific influences, agencies and conditions.

MEDICAL SERVICES

Unquestionably, the greatest force for dealing effectively with individual diseases and diseases in general is the medical service of the country consisting of approximately 90 medical schools, 7,000 hospitals and 145,000 physicians. So in the strength and wisdom of its maturity public health stands to-day in the presence of the individual and his physician, and we realize as never before that the future of public health will be determined by the medical services of the country—by their adequacy and their availability.

PERSONNEL AND FACILITIES

In considering the adequacy and availability of the medical services of this country, let us be sure that we have the same understanding as to what the term is intended to include. Medical services as here used consist of two parts: (1) medical personnel, and (2) medical facilities or hospitals. Medical personnel and medical facilities are so closely related that we get a wholly distorted picture if we look at the one without the other. Adequate facilities—a good hospital service, with the assistance of nurses and technicians—enables 1 doctor under urban conditions to do the work of at least 2 doctors without such assistance. And under rural conditions, where spaces are great and time consumed in travel commensurate, adequate facilities will enable one doctor, with his patients brought to him and with the assistance of nurses and technicians, to do the work of not less than 3 or 4 doctors without such supplementary services. With medical facilities restricted or absent, a large medical personnel is necessary; with facilities provided and adequate, a small medical personnel can meet the needs.

ADEQUACY OF MEDICAL SERVICES

From time to time it is charged that the medical services of this country are inadequate. These charges rest largely upon a decrease in the number of medical schools since 1906, following the raising of the standards of medical education, from approximately 150 to 90, a decrease in the product of the medical school from 23,909 graduates for the quinquennium of 1906–1911 to 16,580 graduates for the quinquennium 1921–1925, a decrease of 30 per cent, and coupled with this decreased medical college output an increase of population from 83,941,510 in 1906 to 113,493,720 in 1925, a net increase of 29,552,210, or 35 per cent. But it is important to note that with this movement of medical school output and population in opposite directions, the proportion of physicians to population fell off but 15 per cent from 1 physician for 670 people to 1 for 772 people, an addition to the average practice of 102 people. Along with this slight decline in medical personnel in proportion to population there occurred a tremendous increase, more than 100 per cent, in medical facilities or general hospital beds. Keeping in mind the fact that facilities double and treble the service arm, the reaching power of the doctor, and that medical services include *both* personnel and facilities, we are safe in saying that medical services have not been decreased, either absolutely or relatively, since the change in the order of medical education and practice (usually regarded as effected in 1906). On the contrary medical services have been greatly augmented. With 1 doctor for every 772 people and with 2.5 general hospital beds for every 1,000 population there is no inadequacy of medical services in this country about which to become alarmed. There are other phases of the

medical problem far more deserving of our concern.

AVAILABILITY OF MEDICAL SERVICES

Medical services may be adequate but not so distributed or placed as to be physically and financially accessible to a large proportion of the population.

With respect to medical personnel, for the year 1923, in towns of 1,000 population and under, there was 1 doctor for 1,238 people; in cities of 100,000 population and over, there was 1 doctor for 536 people, or, in other words, the medical personnel serving urban people was twice that serving rural people. In places of intermediate population groups there was a corresponding intermediate proportion of doctors to people. These figures tell but half the story.

The disproportionate medical personnel is not wholly quantitative; it is also qualitative. The qualitative dislocation of medical personnel is even more important than the quantitative dislocation. Not only is it true that there are twice as many doctors serving urban as rural people, but the doctors of urban communities are, as a rule (to which there are notable exceptions, of course), the best doctors. They are more recent graduates, from the best schools, and the older members of the profession who have kept abreast of the scientific advances of the times. It is, therefore, no exaggeration to say that, considering both quantitative and qualitative factors involved in the existing dislocation of medical personnel, the urban population is at least four times better served than the rural population with scientific medical care. But again be reminded that medical personnel is but one-half of medical service; the other half is medical facilities.

AVAILABILITY OF FACILITIES

Now, with respect to the availability of medical facilities—hospitals, that double and treble and quadruple the efficiency of medical personnel—how do our rural people share with urban communities? or what is the distribution of hospital facilities? In 1925, the distribution of hospitals in the United States was as follows: For 68 cities, with a population of 100,000 and over, there was an average of 22 hospitals; for 76 cities, with populations between 50,000 and 100,000, an average of 6 hospitals; for 143 cities, with populations between 25,000 and 50,000, an average of 3.7 hospitals; for 14,946 cities and towns of 10,000 population and less, an average of .22 of a hospital, or, in another way, in less than one town of 10,000 and under out of 4, nearly 5, such places, is there a hospital. Here, again, however tragically significant, the statistics tell but half the truth.

Many of the hospitals in the smaller places are private hospitals and not available to the general profession and population. A private hospital is a great blessing to a community. But if, as is not infrequently the case, a private hospital serves to make possible an understanding and union between a few practitioners, and operates to exclude the advent and competition of recent and well prepared graduates of medicine, then the private hospital, in keeping out new and perhaps better blood, and blocking the opportunity for a public hospital, loses much or all of its value.

Taking into consideration the fact that the city has twice the medical personnel and, man for man, twice as efficient medical personnel as the country, and that the city has from three to four times the medical facilities of the country, it is most conservative to say that the rural medical services of the United States are considerably less than one-fifth as adequate as urban medical services.

EXODUS OF DOCTORS FROM THE COUNTRY

What caused the doctors to leave the country and move to the town? The study entitled "The Distribution of Physicians in the United States," by Mayers and Harrison, to which we make acknowledgment for much of the statistical ma-

terial of this paper, gives four principal causes for the urban concentration and rural depletion of medical services. They are: (1) the always present stronger drawing power of the city compared to that of the country by reason of greater social attractions, modern conveniences and business opportunities; (2) the marked industrial development incident to and following the Great War which accentuated the ordinary flow of the population cityward; (3) the automobile; and (4) the hospital. A brief consideration of each of these factors in the distribution of physicians is necessary to appreciate their relative importance.

The tendency of man in general, including doctors, to herd and acquire through common interest and effort advantages that may not be obtained by individual or small group effort, explains the always greater proportion of physicians to population in cities than in rural areas. It does not explain the recent accentuation of the movement of physicians away from rural practices. A recent occurrence must be related to a recent cause.

The accentuation of the general movement of population cityward, incident to the industrial expansion associated with war-time activities, is recent. Between 1900 and 1920 there was an increase of 40,000,000 in the national population, and of this rapid growth only a 4,000,000 increase took place outside of incorporated towns and villages. This general migration of population to urban centers carried with it its proportion of doctors. But doctors and patients went together, and unless there was a considerably larger proportion of doctors than patients the general distribution of medical personnel should not have been much disturbed. There was something, however, in the city's pull which acted with a peculiar force on the doctors, for the reason that between 1906 and 1923 rural medical personnel fell off 24 per cent, from 1 doctor to 997 people to 1 doctor for 1,238 people. Here is a *general* tendency, but a *general* tendency does not explain a *specific* effect. We must look further.

CONVENIENCES OF THE CITY

The automobile is another explanation. The automobile enables a good country doctor to locate in his neighboring town and still retain the cream of his old practice; it affords him a wider cruising radius and brings him into competition with other country doctors, making their practices less remunerative and desirable, and so drives some of the poorer doctors where it has led some of the better doctors, into town; it enables country people to go to the more respected town doctor with the bigger reputation and again makes country practices less desirable. But, the effect of the automobile is circumscribed, not general. The automobile does explain the movement of doctors out of county practices and into the county-seat or town, with its population of from 5,000 to 10,000. But, the automobile does not explain the concentration of medical personnel in an ascending scale as we move upward from the smaller to the greater cities. We look for a cause of a more selective character.

The hospital, that is, medical facilities, may be this more selective cause that will account for the quantitative and qualitative dislocation of medical personnel.

In the first place, the development of hospital facilities has been synchronous with this migration of doctors from rural communities to concentrated urban populations. In 1873, there were 149 hospitals in the United States; in 1900, approximately 2,000 hospitals; in 1906, 2,411 hospitals; and in 1925, 6,896 hospitals—an increase since 1906 of 4,485 hospitals.

In the second place, hospitals are not only associated in time with medical migration cityward, but there is physical relation. Wherever medical facilities or hospitals are found and in the proportion in which they are found, there, too, we find medical personnel concentrated.

In the third place, we not only find medical personnel numerically related to

medical facilities but the character of the medical personnel in contact with medical facilities contains the best there is in the profession, the leadership of the profession, and, where the leaders are, the better type of detached doctors, the younger graduates and those in a position to move, follow. Modern medicine cannot be practiced without access to hospitals. This is both the teaching and effect of every medical school. And modern medicine is considerably more than 100 years in advance of the medicine of a generation ago. The practice of medicine to-day without a hospital is not modern; it is antiquated; it is all but ancient.

ADVANTAGES AND ECONOMY OF EFFICIENT RURAL MEDICAL FACILITIES

Rural hospitals or improved rural medical facilities will do three things in the building up of an efficient rural medical service.

First, they will make it possible for the best men now located in the smaller towns and cities to enlarge their field of service, (1) by supplying these men with the same nursing and technical assistance that is available to the medical personnel of urban centers; and (2) by assembling the patients and so saving the time of these better types of rural physicians which would otherwise be consumed in country travel. By such assistance plus such saving of time it will be possible for 1 first-class rural practitioner to give from two to four times the service that is possible without hospital facilities.

Second, improved rural medical facilities will attract more first-class medical men to rural practices and, in so doing, relieve an urban medical congestion that has engendered a spirit of commercialism in medicine, and also relieve a rural depletion of medical personnel that has aroused public concern which has threatened reactionary legislation.

Third, rural hospitals will not only afford a more efficient medical service, measured by modern standards, but will supply a far more economical medical service than is at present available to rural communities.

The public economy of the rural hospitals appears when we consider, (1) the saving of medical mileage fees to rural residents and (2) the saving in the number of doctors necessary for rural practice. Ordinarily, a mileage fee of 75 cents is charged for travel beyond the town or city limits. For a rural resident living from 6 to 10 miles in the country, this means a mileage fee for each visit of from $4.50 to $7.50, a sum more than sufficient to completely pay the hospital charges, including in most cases nursing services and drugs, for the rural patient. Of course, it goes without saying that the treatment given in the hospital will be from two to three times more efficient than that which is possible in the home. As has already been pointed out, 1 good doctor plus a hospital is equal to not less than 3 good doctors minus a hospital. An average county of 30,000 people, let us say, is served by 20 doctors; the average income of the 20 doctors, that is, the cost to the community per doctor, is $5,000. A county is far better supplied with medical services with 1 hospital plus 12 doctors than without 1 hospital plus the 20 doctors. In added medical facilities and subtracted medical personnel we would have an improved medical service with the saving of the cost of 8 doctors at $5,000 each, an annual saving of $40,000. This would more than pay the cost of the hospital to the public for both construction and the treatment of one-third of the patients as charity cases.

Provide rural hospitals and establish that magnetic influence in rural medicine that has attracted the larger and better part of the profession, with the depletion of rural sections of medical care and the congestion of urban centers with medical personnel. Provide rural hospitals and establish that vitalizing influence in medicine without which scientific medicine becomes sluggish, incapacitated, inert, dead.

THE WHOLE CHILD AS A HEALTH UNIT*

IRA S. WILE, M.D., FELLOW, A.P.H.A.
Associate in Pediatrics, Mt. Sinai Hospital, New York City

NO ONE WILL deny that the child is a unit being and that, as such, he possesses a personality that is distinctly his own. This personality should be regarded as a unit, expressive of and symbolizing the totality of the child's reactions in and through living.

The physical status of a child is an important element that enters into his personality, constantly conditioning his development. His health, however, represents more than the sum total of the states of being of his various constituent anatomic systems. A child is not to be regarded merely as an assembly of unrelated parts. How frequently stress is placed upon the facts obtained by medical inspection, as though they give complete information regarding the health of the child. As a matter of fact, medical inspection mainly reveals certain objective, discernible facts relating to the external anatomy, occasionally with some suggestive information concerning the condition of the heart and lungs. It is obvious that such a medical inspection cannot and does not give insight into the actual health of a child without an interpretation of the meaning of the defects noted in their relation to the sum total of the child's physical state. A record of defects is not a table of real or potential health values.

Let us assume that a child can be divided into a number of physical, structural systems, such as skeletal, cardio-vascular, respiratory, nervous, reproductive, and the like. One can discover and relate deficiencies to these definite physical systems. In living, however, all of these systems are coördinated and integrated in such a manner that their interrelations can be determined only through a very careful study of the complete child as a functioning unit. Medical inspection only indirectly throws light upon the functional system of a child. The fact remains, nevertheless, that the health state is to be defined only in terms of actual and potential functions. Descriptions of fractional parts of a child do not reveal the functions of the integer.

The life of a child is thoroughly dynamic. He lives, he moves, he thinks, he feels, he acts. These various phases of his activities are not only thoroughly interwoven, but they possess a marked interdependence. Even slight deficiencies in any one of the spheres of vital activity may profoundly affect, stimulate or thwart activities in any one or all of the other realms of activity. Health enters into and underlies thinking, feeling and action. Health also depends upon thinking, feeling and action.

MEDICAL INSPECTION VERSUS MEDICAL EXAMINATION

So long as medical inspection deals only with sections of a child, it cannot interpret the whole child as a health unit. Each defect possesses a relative health value rather than an absolute one. Its influence upon health and vitality is not wholly inherent in its nature. All children do not respond in the same manner to apparently similar defects. It is apparent that myopia or flat feet, even in the same degree, will have different effects upon the total health of children, considered as individual wholes. Even cardiac diseases have relatively different health values, when they

* Read before the Southeastern District Branch Meeting of the State Teachers Association in New York City, October 15, 1926.

are interpreted in terms of the nature and the degree of the defect and the child's reaction to them.

Possibly one great difficulty has arisen from the fact that judgments concerning defects and handicaps have been based upon the consideration of a normal child. There *is* a theoretic normal child and occasionally one does meet such a rarity. But the average child found in school systems possesses some observable defect. The statistics of medical inspection indicate what marked deviations from the theoretic normal child are to be found in average children.

From the standpoint of total health, the deviations have been over-stressed without due inquiry as to their relative importance to health, generally or specifically of individual children. Many deviations, although constituting a real physical defect, do not necessarily handicap health because of the existence of a variety of factors of safety. This is exemplified in health values after the removal of tonsils, the appendix, the extraction of a tooth, or the amputation of a little toe. The absence of the outer ear, however, affects general health, not by reason of an impairment of hearing, but because the abnormality in appearance reacts upon the entire organism. A number of skin diseases, noncontagious in nature, existent upon covered parts of the body, have less influence upon health as a whole than a single mark or blemish exposed to view. It is needless to state that medical inspection cannot disclose visceral deficiencies of far greater significance for complete health than the defects usually noted. Medical inspection is not the equivalent of medical examination.

COMPARATIVE EFFECT OF PHYSICAL DEFECTS UPON HEALTH

The numerous types of physical deficiencies do not possess equal values in terms of total health. Health is dependent upon the interaction of all the systems comprising the child's physical organism. The functional potentials and the functional service of any one system qualify, stimulate, or retard the effective harmony of all functions upon which health really depends. A congenital condition, such as a cleft palate, is noted as a defect and scores one on a list, just as does the record of observed enlarged tonsils. From the standpoint of health, one recognizes that infected tonsils may be productive of greater physical disease in the way of quinsy, rheumatism, chorea (St. Vitus' dance), and endocarditis (heart disease), than a cleft palate; but, from the standpoint of mental health, comfort and happiness, a cleft palate is more devastating than hypertrophied tonsils. These defects in tabulated statistics would appear to have equal ratings; in total health values they are markedly dissimilar. A lateral spinal curvature is rated as a defect. Its general influence upon health varies according to the degree of the curvature, its location and, indeed, upon its underlying cause. A spinal curvature dependent upon poor posture is far less significant for general health than a similar curvature due to some active disease process, past or present.

QUANTITATIVE AND QUALITATIVE VALUE OF DEFECTS

Defects, like diseases, have a quantitative as well as a qualitative value. Mere enumerations of defects fail to indicate their true relationships to health as a unit. Only to the extent that the child as a whole is considered can one determine health as a unit. Health cannot be isolated from the living organism, because it is an integral part of it. Health serves as a conditioning factor of juvenile activity, welfare and happiness, while at the same time it is an evidence of internal harmonies in child organization. Health represents one phase of human adaptation. It indicates the adaptation of the child as a whole, not merely in his internal organization, but in his responses to external environing pressures.

In considernig the whole child, therefore, it is necessary to evaluate physical defects, deformities or handicaps in terms of their qualitative and quantitative effects upon his functional power. It is obvious that a visual defect, merely noted and regarded as such, does not indicate definite health values. There is a vast difference in the general health values of visual defects, whether noted as a congenital cataract, a trachoma, or a strabismus. These conditions, however, merely suggest a qualitative effect upon general health. Their quantitative effects are represented by the degree of limitation of vision that arises by reason of their presence. The effect of a congenital cataract upon health must be weighed, not merely in terms of the cataract itself, but in terms of all the limitations of functions that arise by reason of the tremendous restrictions of vision. The trachoma has varying results, depending upon the degree of secondary deformity or upon the degree of irritation of the cornea that brings about limitations in eyesight. Strabismus varies considerably in its effects upon eye function depending upon whether it is external or internal; in one eye or in both eyes; whether it is correctible or not by glasses or operation; whether it involves cutting out from practical use one eye; and a host of other problems. At the same time each of these deformities may have a more pronounced influence upon total health because of their relation to the entire personality of the child. The measurable limitation of vision does not indicate the tremendous influence any one of these visual handicaps may have upon the development of a sense of inferiority, fear, or incapacity—out of which arise a lack of confidence, a thwarted physical achievement, and even a limitation of human companionships.

TOTAL HEALTH VALUE OF THE CHILD

It must be recognized that the whole child is superior to any of its parts and that the mere consideration of the health of single units of his organization does not suffice to prove the total health value of the entire child. Bearing this in mind, consider such a condition as caries of the teeth. The effects of caries in the primary teeth are not identical with the effects of the same dental disorder in the secondary teeth. The mere fact that impaired dental structure exists does not necessarily indicate or imply a state of impaired health at the time of observation. In fact, defective dentition, imperfect enamelization, or early decay in the primary teeth may represent health deficiencies that actually originated during the intrauterine life of the child. Some dental defects, therefore, represent not present conditions of health, but the effects of past conditions of disease. On the other hand, caries of secondary teeth may affect general health only slightly compared with the exceedingly severe physical symptoms that may arise from an impacted tooth. Indeed, in some instances, the lack of permanent incisor teeth germs may lead to deformities of the jaw which, when untreated, can affect the entire health of the child to a greater extent than the caries ordinarily entering into statistical tabulations. Incidentally, caries of the 6-year molars has a greater potential danger for total health than caries of any other teeth.

TYPES OF HEALTH EVALUATION

One or two other examples of this type of evaluation may be emphasized. Pronated feet or flat feet may or may not have profound effects upon total health, depending upon the degree of elasticity that exists in the muscles of the feet. Even with a marked degree of extreme malformation, flat feet may be existent over a long period of years with a far less baneful effect upon total health than arises from the wearing of incorrect shoes by people with normal arches. The term, "heart disease," carries with it implications which are not always warranted. The heart is an exceedingly important part of the health mechanism, but when it is diseased, its influence upon total health must be measured in terms of the

general effects upon the child as a whole. This varies according to the nature, location and extent of the cardiac lesion, the degree of muscular involvement and, indeed, upon the degree of consciousness that the child possesses of the existence of the cardiac disease. A cardiac neurosis, for example, may be more profound in its limitations of activity, than is warranted by the actual cardiac defect. The whole child with a neurosis plus a physical disease underlying its existence has a totally different health value from a non-neurotic child with the same degree of physical affliction.

From the teacher's standpoint an elaborate report of physical defects possesses value only in terms of their effect upon the child's function. Delays or irregularities in school progress may represent interferences with mental function incidental to a lack of bodily harmony rather than a fixed deficiency in intelligence or an inhibiting emotional distress growing out of environing conditions. Under ordinary circumstances caries or a correctible astigmatism is less significant for meeting school conditions than are diseases of the heart, lungs, or even severely diseased tonsils. From the viewpoint of pedagogy flat feet are less important than running ears. Indeed, a permanent hairy mole on the face may be more disastrous for attentiveness and concentration in school than a stiff knee, or chronic indigestion. The teacher's evaluation of total health, therefore, should arise from an interpretation of function as noted in child behavior rather than from a contemplation of a list of specific anatomic variations. In fact, single anatomic defects should not be over-stressed and they merit pedagogic attention only in so far as they give rise to disorders in function that are evident in conduct in school.

The school aspects of health are more generic than those ordinarily described by medical inspectors. Teachers deal with children as totalities and unities, as biologic and social beings.

RELATION OF MENTAL AND PHYSICAL DEFECTS

Laying aside for the moment the purely physical phases of juvenile life, it is apparent that the intellectual potentials of children are bound up in their total health values. Mental slowness may arise from underlying physical disabilities as, for example, from a poorly functioning thyroid gland, but an innate mental slowness may be responsible for diminished activity, for sluggishness, discomforts and dissatisfactions which react upon the total physical life of the child. It is obvious that mental activity may be conditioned by a vast variety of physical defects, but it may be more dependent upon unhygienic living. Inadequate sleep, insufficient or unbalanced dietaries, or other factors undiscoverable by inspection may profoundly affect the general school attitudes and applications as part of their unfavorable influence upon the total health of the child.

Too frequently, the hygienic elements are not included in contemplating total health. In connection with this statement it is apparent that school hygiene possesses definite and special importance in affecting the complete well-being of children. School hygiene, in this interpretation, does not refer merely to light, ventilation, height of seat and desk, but it refers also to the hygiene that results from the personal relations between the teachers and pupils. A dyspeptic, sarcastic, irritable or nagging teacher can lower total health values and bring about nervous disorders and emotional difficulties, which are more pernicious than the effects of a large variety of simple anatomic handicaps now deemed of primary importance.

SIGNIFICANCE OF SOCIAL DEVELOPMENT

The whole child, as a biologic organism, possesses a social side which should not be separated and considered a distinct phase of its development. His social experiences, his contacts with environing forces, animate or inanimate, in the home and in the school, markedly affect his

emotional qualities. The influence of the emotional life upon the total health is of paramount importance. The development of states of fear, inferiority, consciousness of defeat, thwarting or failure, has definite relations to juvenile activity and vitality. Mental health becomes all the more significant in the recognition of the problems of school children. A consideration of the health unity of a child calls for an appreciation of the emotional components entering into his health. The whole child evidences his health reactions in terms of the interaction of his internal mechanisms and his external world.

BROAD CONCEPT OF TOTAL HEALTH

Our concept of total health is thus widened. It is desirable to appreciate unity in health as the fusion or ultimate expression of the several phases of child nature which enter into the manifestation of health. It is evident, therefore, that due thought must be given to the physical, intellectual, emotional and social life of children in order to arrive at this broad concept. Susceptibility to nervous disorders is as important as susceptibility to contagious diseases. Satisfactions in school life and achievement are as effective factors in promoting general physical comfort as are sound teeth and an excellent appetite. Agreeable companionship and social success contribute to total health almost as much as do the harmonious activities of the basic physical systems.

The whole child is the health unit. Disorders in any sphere of juvenile action result in altered health values. Complications of life and health are not limited to the tangible elements in physical organization.

Health is a dynamic unit, a product of living, and involves the sum total of vital processes of the whole child in and through living.

NEEDED RESEARCH IN SEWAGE DISPOSAL*

WILLEM RUDOLFS, PH.D.

Chief, New Jersey Sewage Experiment Station, New Brunswick, New Jersey

ARTIFICIAL SEWAGE disposal, a relatively new branch of sanitary science, becomes more and more necessary with the growth in density of population. A review of the various methods of treatment shows that during the last 35 years new devices and processes have been tried—sometimes with claims as to economy and efficiency far in excess of actual performance. Biological sewage treatment has been employed by sanitary engineers, often with considerable success, in spite of the apparent lack of interest displayed by biologists, biochemists and physical chemists. The present trend of treatment is practically wholly along biological lines but this does not necessarily mean that combinations of biological, chemical and physical methods are exhausted. As a matter of fact we are only beginning to see light along biological lines and the combination of biological, physical and chemical treatment is still in an empirical stage.

The research needed in sewage disposal is (1) fundamental and (2) coöperative.

FUNDAMENTAL RESEARCH

The fundamental research should be conducted in well equipped laboratories where different factors can be kept constant. The laboratory findings should then be tested at adequately supervised

* Read before the Public Health Engineering Section of the American Public Health Association at the Fifty-fifth Annual Meeting at Buffalo, N. Y., October 14, 1926. Paper No. 315, Journal series of the New Jersey Agricultural Experiment Station, Department of Sewage Disposal.

disposal plants. Biochemical studies dealing with biological treatment should naturally be comprised of thorough studies of the fate of the most important components of sewage (carbohydrates, nitrogenous substances, fats, etc.) and the factors governing or aiding their decomposition or stabilization. This necessitates investigations dealing with the organisms responsible for decomposition of the different components, the effects of temperature on their activities, the effect of reaction of the medium, the effect of intermediate and end products produced in the course of digestion on the total activities, the effect of possible catalyzers, the rôle played by bacterophages, the effect of concentration and physical condition of sludge on digestion. The effect of chemical and environmental conditions for incomplete treatment is not well understood.

In such investigations the efficiency of existing treatment plants is an important incidental. Immediate practical results are necessary but should not be overemphasized because an effort merely to improve poorly working plants without a general knowledge of the cause of the poor conditions, leads to a scattering of energy and prevents workers from devoting their time to fundamental investigations. The cause of odors, the changes produced in the biological equilibrium by chemical, mechanical or environmental means and similar problems will be solved only when we know more about the organisms in sewage and the factors governing their activities. However, such studies are of such a complex nature that only a well equipped force can handle them.

The trend of sewage disposal is now in the direction of bio-physico-chemical treatment and studies on the biological treatment of sewage must take greater account of the physico-chemical factors. As two examples of the present trend, two systems of treatment may be cited: (1) increasing the rate of settling of solids by a combination of mechanical means (Dorr Clarifier, Link-Belt mechanism) followed by reaction adjustment and digestion; (2) partial aeration before and after settling of solids, combined with mechanisms for settling fresh solids, mechanical distribution and mixing of fresh solids with ripe sludge and lime for adjustment before digestion, followed by biological decomposition. Very little is known as yet about the reasons for the effect of mechanical devices, used alone or in combination, upon the efficiency and consequent economy of treatment. The difference of opinion over physical-chemical treatment (the use of electricity-paddles-lime or so-called direct oxidation methods) is probably caused by a lack of appreciation of the effect of physical or chemical processes. Those who claim that sewage treatment is or should be purely physical or physical-chemical are probably as far from the truth as are those who claim that treatment is or should be purely biological.

In the case of trade wastes and some mixed sewages physical-chemical processes seem at present to be all-important. However, it should be borne in mind that the substances in trade wastes do not always prevent bacterial action. For instance, strong arsenical solutions used for cattle dips are rendered useless almost overnight by bacterial action and similarly it is quite often very difficult to keep bacteria and fungi out of fairly concentrated dye solutions and that biological treatment of phenol wastes is possible, it would seem that in trade waste disposal biological treatment is quite possible. Here again fundamental research will help us.

COÖPERATIVE

Coöperative research can be performed in two ways: Researches conducted by several organizations and individuals may attack the same problem from different angles or the workers may divide the field into different parts, each devoting his time and energy to a particular problem or series of problems. To make such

coöperation fruitful we first must have a number of such research laboratories. Again, research can be carried out by an organization equipped for fundamental research in coöperation with sewage disposal plants in active operation. Such coöperation may be with individual plants or on problems of general importance with groups of plants located in different parts of the country. Our laboratory has conducted coöperative work with individual plants, for example, in Plainfield, Baltimore, and an attempt has been made to work with groups of plants. Procedures developed in the laboratory have been tried out on a large scale at the plant and difficulties encountered at plants have been studied in the laboratory. Much information has resulted from this active coöperation.

WAYS AND MEANS

It has been pointed out that fundamental research can be carried out only in laboratories staffed with biochemists, bacteriologists, zoölogists, engineers and possibly botanists. Such men, with different training, can attack the problems in hand from as many sides. The few existing research laboratories must therefore be rounded out. But more important still, we need an increased number of well organized and well equipped laboratories.

Moral support and money are necessary to make fundamental research in sewage disposal a success. Without money no investigation can be conducted yet there should be no hesitancy to place moral support first. Moral backing by sanitary engineers and public health officials is of prime importance. It might be said that if one "produces the goods" moral support will follow, but sewage research, dealing with such complex problems, will nearly always be of more or less long duration before results can be measured in dollars and cents.

Fundamental research in sewage disposal is of national or perhaps international interest. Evidently, therefore, the national government should be one of the first agencies to supply money for this purpose, but states and municipalities appropriating funds for sewage research will receive quickly value for their money because conditions affecting sewage disposal vary in different parts of the country. National organizations and institutions engaged in public health work are in a particularly good position to give moral and financial support to sewage research which will ultimately become a factor in the reduction of water borne diseases and the protection of potable water supplies. Companies and concerns dealing directly or indirectly with sewage disposal may find it profitable to give grants for sewage research, when special or particularly difficult problems are encountered.

PUBLICATION OF RESULTS

The need for fundamental and coöperative research in sewage disposal seems apparent, but information obtained in research is of little avail if it cannot be published to reach those who need such information. At present there is no single organization made up of only those who are engaged in sewage work. Material, if published at all, is widely scattered and sometimes fairly inaccessible. Papers delivered before the New Jersey Sewage Works Association are published in the proceedings which are printed in a limited number, papers read before other state groups are sometimes printed in pamphlet form and at other times not at all. The engineering journals are naturally not anxious to print material dealing with laboratory experiments which are of a more or less theoretical nature. If sewage research will reach the point we hope and expect it will, there should be an adequate outlet for its products.

To summarize: We need fundamental and coöperative sewage research, supported morally and financially, and an outlet for the publication of results.

THE PLACE OF THE BANANA IN THE DIET*

WALTER H. EDDY, PH.D., AND MINERVA KELLOGG

Laboratory of Physiological Chemistry, Teachers College, Columbia University, New York City

AT THE MEETING of the American Public Health Association in St. Louis in 1925 certain preliminary experiments[1] on the vitamin value of the ripe banana were reported. These experiments having now been completed it has seemed worth while not only to present them, but to include a review of the scientific data now available as a basis of judgment in allotting to the banana its place in the dietary world.

The presence of certain vitamins in the fruit has been reported by several investigators prior to studies in our laboratory. H. B. Lewis[2] reported in 1919 that 10 to 15 g. of banana daily constituted a protective dosage for guinea pigs against scurvy. In 1922, Givens, McCluggage and Van Horne[3] found 10 g. adequate, and still more recently Jansen and Donath[4] working in Java on the Indian bananas (pisang radja and pisang ambon), found these fully protective against scurvy in guinea pigs in 10 g. daily doses and in some cases efficient in 5 g. doses. The two earlier workers used basal diets since shown to be defective in other factors than vitamin C and they did not test dosages below 10 g. Jansen and Donath worked with a diet† complete in all known factors and in most respects directly comparable with the diet worked out by Sherman and LaMer[5] for quantitative vitamin C measurements. They also used dosages of 2.5 g., 5 g. and 10 g. of banana. Scurvy resulted in all animals on the 2.5 g. dosage. Of the 6 animals on 5 g. dosage, 4 were very slightly hemorrhagic, 1 completely protected and 1 not autopsied. The test period was 105 days.

Our own studies were upon the banana which constitutes the bulk of the American supply (a variation of Musa sapientum known as the Gros Michel). We fed the raw banana in ripe form (peel thin and color yellow flecked with brown spots), and in partly ripe form (yellow but with green tip). We also used the partly ripe bananas baked in the skin and baked with skin removed. The ripe bananas were cured for us by the United Fruit Company under controlled temperature, humidity and oxygen content of ripening room and were brought to the laboratory twice a week to make sure that no over-ripe fruit be used and to insure uniformity in the fruit fed during the entire 90-day periods. We used the Sherman-LaMer basal diet‡ in all tests and all the pigs were given a preliminary 2-weeks' test to determine their suitability for experiment. Pigs with an initial weight of about 350 g. were selected for the tests.

Confining the attention to ripe raw bananas alone for the moment we found (see Chart I) that the minimum protective dose was 5 g. daily per pig with optimum growth at from 7 to 10 g. daily.

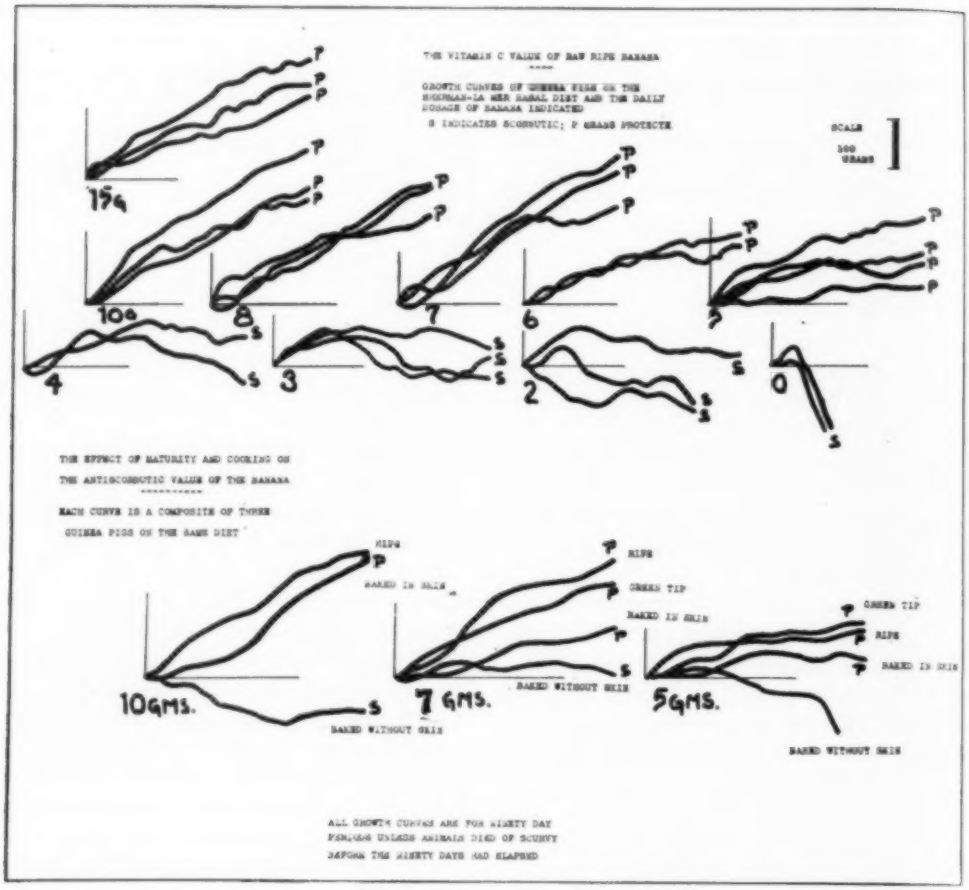
Since, however, bananas are often eaten after cooking, we included comparisons with partly ripe raw bananas, the same baked in the skin and without the skin. The partly ripe banana like

* Read before the Food and Drugs Section of the American Public Health Association at the Fifty-fifth Annual Meeting at Buffalo, N. Y., October 13, 1926.

† Jansen and Donath's basal diet consisted of 80 parts unpolished rice, 20 parts heated skim milk powder, 2 parts of a salt mixture practically that of Osborne and Mendel, and ¼ part cod liver oil.

‡ The Sherman-LaMer[5] basal diet consists of 59 parts ground whole oats, 30 parts heated skim milk powder, 10 parts butter fat and 1 part NaCl.

CHART I


THE VITAMIN C VALUE OF RAW RIPE BANANA
GROWTH CURVES OF GUINEA PIGS ON THE SHERMAN-LA MER BASAL DIET AND THE DAILY DOSAGE OF BANANA INDICATED
S INDICATES SCORBUTIC; P GRAMS PROTECTS
SCALE
100 GRAMS
15g
10g
8
7
6
5
4
3
2
0
THE EFFECT OF MATURITY AND COOKING ON THE ANTISCORBUTIC VALUE OF THE BANANA
EACH CURVE IS A COMPOSITE OF THREE GUINEA PIGS ON THE SAME DIET
RIPE
BAKED IN SKIN
GREEN TIP
BAKED WITHOUT SKIN
10GMS.
7 GMS.
5GMS.
ALL GROWTH CURVES ARE FOR SIXTY DAY PERIODS UNLESS ANIMALS DIED OF SCURVY BEFORE THE SIXTY DAYS HAD ELAPSED

other immature fruit and vegetables is slightly richer in vitamin C than the fully mature form but the difference is slight. Since modern science has shown that for other reasons the banana in the partly ripe form should not be eaten unless cooked, the series served mainly as a control in comparing the effect of methods of cooking.

The practical point which developed from these studies was the demonstration that retention of the skin during the cooking period is an efficient protection against destruction of the antiscorbutic vitamin. Yellow bananas baked in the skin protected guinea pigs from scurvy in doses of 5 g. daily, but it took 15 g. of the same kind of banana baked without skins to accomplish this protection. The raw banana controls in this series were protective in 4 g. dosage (yellow skin, green tipped fruit). We interpret this protective action of the skin to prevention of oxidation during the heating process.

Eddy and Kohman[6] showed that the elimination of oxidation by the commercial canning process permitted heating with much less vitamin C destruction than occurs when the same foodstuffs are heated in open kettles. Sherman, LaMer and Kenny[7] have recently measured quantitatively the effect of removing from tomato juice the molecular oxygen prior to heating and have shown that such a procedure reduces the heat destruction of vitamin C, previously reported by LaMer as 68 per cent, to 10–20 per cent.

The results (Chart I) confirm previous studies in placing the banana among the important sources of antiscorbutic factor. Its comparability with other antiscorbutics now in use in infant feeding follows:

Antiscorbutic	Minimum Daily Protective Dose for Guinea Pigs	Authority
Orange juice	3 to 5 c.c.	Hess and Unger and Dutcher, Harshaw and Hall
Tomato juice	2.5 to 3 c.c.	Sherman and LaMer
Ripe banana	5 g.	Eddy and Kellogg

cal School, Children's Hospital, Boston, we submit herewith X-ray and other data pertaining to a case of infantile scurvy treated and cured by a diet consisting solely of bananas and milk. (See plates and Case Record.) The baby was 8 months old and weighed 12 pounds. A banana milk diet was made by whipping into 570 c.c. of milk 200 g. of ripe raw banana. The baby was fed 120 c.c. of this mixture every 4 hours. No other

X-ray of Case of Infantile Scurvy Treated by Diet of Banana and Milk

April 23, 1896

May 4, 1896

May 11, 1896

May 25, 1896

Until, however, the experiments with animals are confirmed by experiments with humans the transferability of the results is open to question. Through the courtesy of Dr. Joseph Johnston, of the Department of Pediatrics, Harvard Medi-

food or antiscorbutic was necessary. The child tolerated the mixture without any signs of digestive disturbance, gained in weight and recovered from scurvy. In this case the banana not only provided the antiscorbutic but also the necessary carbo-

hydrate to modify the milk suitably. The results confirm the conclusion stated by Sugiura and Benedict[8] in 1919, viz.: "Our experiments suggest that a combination of banana and milk, in proper proportion, constitutes a complete food."

THE VITAMIN A CONTENT OF BANANA

Munsell[9] using the quantitative method developed in Sherman's laboratory for measuring vitamin A values found that banana in 0.4 g. daily dosage sufficed as a source of the vitamin to produce 25 g. gain in 56 days in white rats fed on a basal diet adequate in all known factors except vitamin A. These rats were taken at 30 days age and fed on a vitamin A-free diet until completely deprived of stored vitamin. This amount represents what the U. S. Pharmacopeia has defined as a "unit" of vitamin A. Her result would make the banana, in spite of its low fat content and high water value, about 1/20th the value of good butter as a source of vitamin A.

Using the same procedure we obtain essential agreement with Munsell as shown in Chart II. In our tests the majority of the animals on 0.4 g. failed to make 25 g. gain in the period while 2 surpassed that figure. All on 0.5 g. equalled that gain or bettered it. The unit value, therefore, lies between 0.4 and 0.5 g. We modified part of our series by adopting Steenbock's suggestion and irradiating the ration to insure adequacy of vitamin D in the diet. The irradiation did not change the results. (See Chart II.)

In his third edition of the *Chemistry of Food and Nutrition* Sherman has expressed the vitamin A value of the 3 antiscorbutics as follows:

Fruit	Units of Vitamin in One Ounce of Units
Orange juice	About 20
Tomato juice, raw or canned	170
Banana	100?

Our results would put the banana in this series as 56 units per ounce if we are conservative and consider 0.5 g. the unit.

CASE RECORD

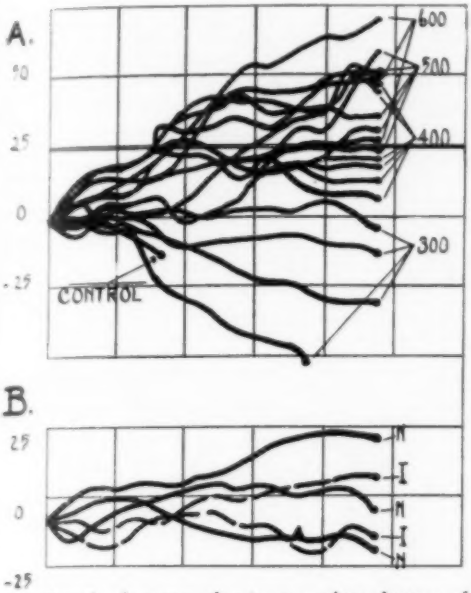
M.R. Age 8 months, female.
F.H. Irrelevant.
P.H. Birth: Labor dry but uncomplicated. Birth weight 5 pounds, 4 ounces. Present weight (April 23, 1926) twelve pounds.
Feed: 1. Breast for three weeks.
2. Several formulae composition unknown.
3. For past three months the following:

Butter	4 tbsp.	5½–6 oz. q3.
Flour	5 tbsp.	
W.M.	10 oz.	
Water	20 oz.	
D.M.	3 tbsp.	

The baby has gained on this formula. Cod liver oil ½ dr. t.i.d. for two months. No orange juice. Made up according to standard butter flour mixture.
Develop.: Holds head up but does not sit up. Has no teeth.
P.I.: Pertussis at six months, breast abscess 3 weeks ago.
Present Ill.: Child brought to the hospital because she did not gain well; pallor and because recently her legs seemed tender when touched.
P.E.: Measurements:
Ht. 26"—Head 17½"—Chest 15½"—Abd. 14".
An 8 months old, 12 pound baby, rather pale and extremely irritable, but not acutely ill. Exhibits generalized tenderness when she is handled and this is more pronounced when extremities are palpated. Both eyes are pushed forward prominently but there is no hemorrhage obvious. Right ear discharging pus. There are no teeth, gums slightly blue, no hemorrhages. Costa-chondral junctions enlarged into smooth prominence, not preceded by groove. Heart and lungs seem normal. Liver and spleen both palpable. Extremities show definite enlargement at their epiphyses and this enlargement extends back to a considerable distance from the end of the bone.
Lab. data: Urine negative.
Blood: RBC 3,900,000. Hbg. 60%; WBC 12,400.
PMN 52%; L 40%; L Mono 8%. Wassermann negative; Tuberculin negative; Blood calcium 10%; Phosphate 4½%. X-Ray confirmed initial impression of scurvy.
She was fed the following mixture: Milk 570 c.c. and ripe bananas 200 grams. The milk was boiled and then the bananas (fully ripe ones used) were whipped into it. She received 120 c.c. of this mixture every four hours.

COURSE:
She had a slight fever on admission and this continued for two weeks. At the end of about ten days the swellings above her knees continued prominent and the child continued to show fever. The question of osteomyelitis was raised but a repeat X-Ray at this time showed marked deposition of calcium about the hemorrhage under the periosteum. She remained in the hospital 5 weeks and was discharged well. The time of the disappearance of tenderness and the appearance of the calcification seemed approximately to coincide with that we have come to expect when using oranges or tomatoes as antiscorbutics.

CHART II



A. Growth of curves of rats on various dosages of banana as a source of vitamin A. Note that intake of 400 milligrams per day is slightly less than sufficient to produce 25 grams gain in 60 days and 500 milligrams is more than enough. Four hundred milligrams is about 1/75 of an ounce.

B. Irradiation of the basal ration fails to affect results. The curves represent a single litter of rats receiving 400 milligrams of banana daily as a source of vitamin A. The two rats with broken growth line and marked (I) had the basal ration irradiated with ultra-violet light. (N) means non-irradiated.

THE VITAMIN B VALUE OF BANANA

At the present time data is accumulating[10] to show that what we have called the B vitamin is probably divisible into at least 2 factors, an antineuritic and a growth stimulating factor. Until this is fully confirmed it is necessary to content ourselves with the current test methods for vitamin B and in our studies we have used the method developed by Sherman and his coworkers[12] to estimate the source of B necessary to produce 20 g. gains in 56 days in white rats. In our tests the gain noted and the absence of polyneuritic symptoms are the criteria on which conclusions as to B potency rest.

In 1918 Sugiura and Benedict[11] reported: "The banana is deficient in (a) protein and (b) the *water-soluble accessory* as a foodstuff for the growth and maintenance of albino rats." This work has unfortunately been used by many as evidence that bananas lack all vitamins. More refined methods for estimating vitamin B values have developed since these tests were made. Our results as shown in Chart III demonstrate that while the banana is not rich in vitamin B in comparison with yeast or wheat germ it has about the vitamin B value of tomato juice. Sherman and Grose[12] showed with this method that it takes 10 c.c. of tomato juice or 6 c.c. of milk to produce 20 g. gain in white rats in 56 days. Our tests show that 8 to 10 g. daily of ripe raw banana will accomplish the same result when used as the sole source of vitamin B in an otherwise adequate diet. It is difficult for the rat to take this amount and at the same time eat adequately of the basal diet. The series shows the variations resulting from this difficulty. It was finally overcome by subtracting from the basal diet the amount of carbohydrate supplied by the banana. The series labeled "adjusted basals" shows these results.

THE BANANA DEFICIENT IN VITAMIN D

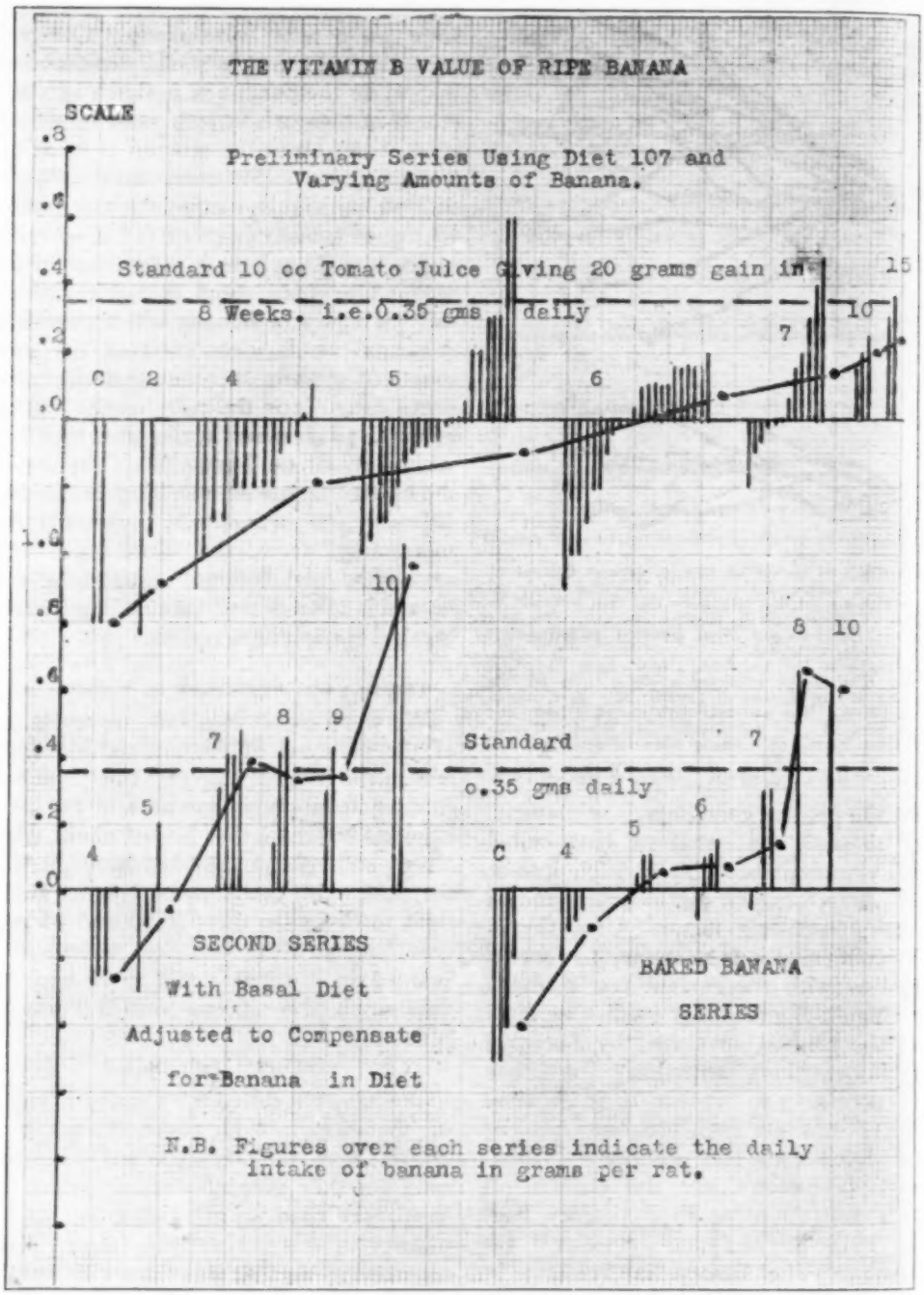
We were unable to obtain any evidence of the presence of the antirachitic vitamin in the banana. To test this point we contrasted rats on Sherman and Pappenheimer's[13] rachitic diet No. 84 alone, with others on the diet modified by replacing the flour with amounts of banana sufficient to make the diets 5, 10 and 15 per cent banana. On all diets rickets developed with severity and there was no diminution of symptoms with increase of banana.

VITAMIN E IN BANANA

We have not tested the vitamin E value of the banana. However, Evans and Burr[14] have recently reported its presence but they give no data on which to base more than an approximation to its potency in this antisterility factor. The report suggests that it is not a rich source of this factor.

From the various tests now available it seems safe to class the banana as an excellent source of vitamins A and C; a good source of vitamin B; deficient in

CHART III


THE VITAMIN B VALUE OF RIPE BANANA
SCALE
Preliminary Series Using Diet 107 and Varying Amounts of Banana.
Standard 10 cc Tomato Juice Giving 20 grams gain in 8 Weeks. i.e.0.35 gms daily
Standard 0.35 gms daily
SECOND SERIES With Basal Diet Adjusted to Compensate for Banana in Diet
BAKED BANANA SERIES
N.B. Figures over each series indicate the daily intake of banana in grams per rat.

vitamin D and not lacking in vitamin E. Its potency in C, the availability and the relative cheapness of the fruit, make it a competitor with tomato juice and orange juice for use in infant feeding on vitamin basis alone. Its use will not, however, eliminate the necessity for cod liver oil or sunlight to avoid incidence of rickets.

NUTRIENT VALUE OF THE BANANA

Obviously vitamin value does not constitute the sole basis for judging the place of a foodstuff in the diet. Bananas hold a rather unique place among fruits and vegetables as being unusually rich in utilizable carbohydrate. In fact, their main claim to consideration in the past has been as energy foods of relative cheapness. The analytical data available tells us the following about the nutrients in the banana (edible pulp):

COMPOSITION OF THE BANANA

Factors	Per cent	Investigators
Water	75.3	Atwater and Bryant and Sherman
Carbohydrate	22.0	Atwater and Bryant and Sherman
Sugars	19.85	Gore
Fat (ether ex.)	0.6	Atwater and Bryant and Sherman
Protein (Nx6.25)	1.3	Atwater and Bryant and Sherman
Cellulose	0.81	Tibbles
Ash	0.85	Gore
	0.8	Atwater and Bryant and Sherman
Calcium	0.009	Sherman
Magnesium	0.028	Sherman
Potassium	0.401	Sherman
Sodium	0.034	Sherman
Phosphorus	0.031	Sherman
Chlorine	0.125	Sherman
Sulfur	0.010	Sherman
Iron	0.0006	Sherman

The only factor that undergoes change in character during ripening is the carbohydrate so far as is known at present. Starting with 22 per cent starch this undergoes hydrolytic change to sugars and in the fully ripe form Meyers and Rose found 18.8 per cent sugar of which 11.1 per cent was sucrose and 7.1 per cent invert sugars (glucose and fructose). The enzymes concerned are not definitely known nor the origin of the sucrose from the starch.

The utilizability of the sugars has been well established. Data is however lacking on the utilization of the other factors listed. We know for example very little about the banana protein. Its small amount has made the fruit valuable as a means of increasing the carbohydrate in a diet without at the same time appreciably increasing protein content, and in the treatment of nephritis the fruit has found a use on this account alone.[20]

Thomas[18] in 1910 reported that on an intake of banana sufficient to provide 4.32 grams of nitrogen and 2,471 calories he could not maintain nitrogen equilibrium even though the urinary output was brought as low as 3 g. Lusk states the following in his *Science of Nutrition:* "Whereas 5 parts of potato nitrogen may replace 4 parts of body protein in establishing nitrogen equilibrium the banana protein is not so efficient." As a matter of fact, however, we do not know to-day how much of the banana is protein. All analyses have merely measured nitrogen, multiplied by the factor 6.25 and called the product protein. I have found no data in the literature which describes the extraction of the banana protein *per se.* We are, therefore, at present investigating this problem. We have succeeded in obtaining a globulin fraction but no water soluble or alcohol soluble fraction. A Van Slyke analysis of banana flour has shown that at least 60 per cent of the nitrogen in amino N. Banana flour made from green bananas is proving a utilizable food and as its protein content is about 4 per cent on the Nx 6.25 basis, we must know more about this protein if we are to use the flour intelligently.

The fat value is "ether extract." It is too small to be significant in calculating calorie values but justifies investigation as to nature. Such data is entirely lacking to-day.

The ash content is significant. It is basic in reaction placing the fruit among the acidosis preventing foodstuffs. It carries enough calcium, magnesium and iron to make it worth considering as a means of correcting diets deficient in these elements.

Here as with protein we lack utilization data. Chaney and Blunt[16] have recently shown that orange juice combined with milk in the diet actually increases the utilization of calcium in the juice. The reaction of the digestive tract has been shown by a number of investigators to play a rôle in the utilization of calcium and phosphorus. Arnold[17] has suggested

the rôle of foodstuffs as means of changing intestinal flora and hence pH. Bergeim[18] has also shown that lactose added to the diet of a rachitic animal markedly increases calcium absorption. In a single experiment with the white rat using Bergeim's method we have found that the addition of banana to milk powder increases the calcium absorption 4 per cent, but these results require further check and such experiments are in progress.

We might cite other data to the same effect but these alone show that we must know both the amounts of nutrients in the food and the amounts absorbed before we can satisfactorily assign to a food its place in the diet list.

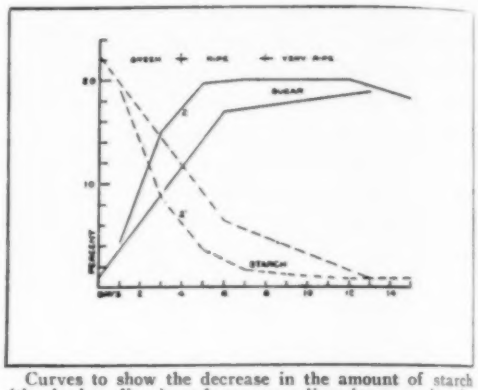
We have much data bearing on the utilization of banana carbohydrate, but practically none on the utilization of protein, fat or mineral salts.

IS THE BANANA DIGESTIBLE?

It is now abundantly demonstrated that raw bananas should be eaten ripe and that partly ripe fruit can be handled without digestive disturbance if it is cooked. What happens when the banana ripens? The most striking change is in the conversion of starch into sugars of which about 11 per cent is sucrose and 7 per cent invert sugar. This in itself is, however, hardly adequate to explain the result of eating unripe fruit. Langworthy's work has abundantly demonstrated that raw starch is digestible. In brief, the disturbances caused by eating unripe banana are probably not at all due to raw starch.

F. E. Lloyd[19] has studied extensively the changes that take place in the ripening process. He finds that the pulp of the green banana consists of a set of cellulose sacs cemented end to end and side to side by pectose and packed with sap and starch grains. As ripening takes place the pectose is changed to water soluble pectin setting free the cells. This change requires the presence of oxygen and is inhibited in an atmosphere of inert gas such as CO_2. Oxygen is also required for the

CHART IV



Curves to show the decrease in the amount of starch (the broken lines) and corresponding increase in the amount of sugars (continuous lines) based upon two different sets of analyses made by Dr. H. C. Gore, U. S. Bureau of Chemistry.

conversion of the starch to sugar. All these changes are inhibited by chilling which explains why unripe bananas should not be put in the ice chest.

It may be that the pectose-pectin change partly explains the indigestibility of unripe fruit. Lloyd, however, believes that the tannin in the fruit is a factor. He has found[20] that as fruit like the banana or persimmon ripens, a curious phenomenon occurs involving the binding of the tannin by a sort of gel so that it can no longer exert its properties. The tannin is not destroyed but a substance soluble in the water of the tannin bodies is first changed to gel and this gel binds the tannin molecule. As Lloyd puts it: "The non-astringency in the banana, when ripe, is, therefore, due to the formation of a sort of vegetable leather which cannot give up its tannin." When the unripe fruit is cooked, the starch gel is supposed to serve the same purpose. Support for this view was provided by Clark[21] in his chemical study of the tannin masses of the green persimmon, which are similar to those in the banana.

A. R. Rose[22] has reported the extraction of a starch free solution from green bananas that is a powerful digestive disturber. He has as yet failed to identify the active principle.

We have then various views as to why the unripe fruit is harmful but no certain

answer. Practically, however, this factor disappears with ripening or cooking for we now have abundant controlled experiments to show that ripe or cooked banana is tolerated by normal adults, children and infants and by invalids of various types. The work of Chace, Myers, Rose and Pease[23] demonstrated this point, and new data are steadily accumulating. Haas[24] has shown that in celiac disease the banana can be used when other carbohydrates are not utilized and this work has recently been confirmed by Irish.[25] Myers and Rose say that much larger quantities of sugar can be given in the form of banana than as pure sugar without gastrointestinal disturbance.

It must, of course, be borne in mind that the experiments cited were with thoroughly masticated banana in diets balanced as to other factors. Most of the reported disturbances are probably traceable to eating the fruit unripe, to too hasty eating or to imbalance in the diet.

CONCLUSIONS

With such data as are now available the use of the fruit, properly supplemented with other factors necessary to complete the diet, is permissible with all ages. The data lacking to-day are largely that bearing on the conditions necessary to make its factors utilizable. We need to know more about the behavior of its proteins and salts in the digestive canal and its behavior in specific disease conditions.

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HOOKWORM INFECTION IN STRAITS SETTLEMENTS

The final report on the survey of hookworm infection, general sanitary conditions and organized health work in the Straits Settlements by M. E. Barnes, M.D., Dr.P.H., and Paul F. Russell, M.D., of the International Health Board, is of much interest to public health workers. It is found that the average hookworm infection rate for the Colony is 73.3 per cent, although variations from 29.3 per cent to 80.1 per cent are noted. The highest rates are found among the Malays, Indians, Eurasians, Japanese, and Chinese in the order mentioned, the rates among males and females being practically the same. Hookworm disease accounted for the death of approximately 2 per cent of all cases coming to autopsy in Singapore during the past 18 years. Several graphs have been prepared which strikingly show the downward trend of hemoglobin with increasing numbers of hookworms. The report concludes with several recommendations concerning health organizations, improved methods of securing accurate diagnoses, and special types of health work. I. V. H.

THERMAL DEATH POINTS OF PATHOGENIC BACTERIA IN MILK

THEIR INFLUENCE IN DETERMINING THE TEMPERATURES FOR COMMERCIAL PASTEURIZATION

WILLIAM H. PARK, M.D., FELLOW A.P.H.A.
Bureau of Laboratories, Department of Health, New York City

THIS is the second of a series of papers on milk to be published in the JOURNAL. These papers were read at the Fifty-ninth Annual Meeting of the American Public Health Association at Buffalo, October, 1926. The Report of the Committee on Nutritional Problems in Relation to Health was published in December. This report also comprised the Report of the Committee of Dairy Products.

The following papers have been scheduled for publication in succeeding issues of the JOURNAL:

Definitions of Pasteurization and Their Enforcement
Leslie C. Frank
Chicago's Program for Correction of Pasteurization Defects
George W. Putnam
Some Observations on the Treatment of Milk by an Electrical Method
Samuel C. Prescott
Classification and Grading of Milk
Ernest Kelly
The Effect of Different Temperatures for Pasteurization upon the Entire Flora of Milk
M. J. Prucha
Report of the Committee on Milk Supply
Discussion of Milk Papers

THE THERMAL death point of bacteria can be definitely determined by placing the different varieties of bacteria in milk and heating them to different degrees for different periods of time and testing their viability.

In testing the thermal death point in milk, as we will take up later in detail, we have to guard against improper methods such as cause the formation of a film through contact with the air, or foam, either of which will expose the bacteria in them to a temperature different from that intended. Having decided the thermal death point for the pathogenic bacteria in milk at the time desired, we must determine how much additional heating must be applied to the milk during commercial pasteurization to allow for mechanical defects and so insure sufficient heating of every portion of the milk for the desired time. This is what we know as the margin of safety, and it varies in different machines according to the perfection of the construction and operation.

There are certain general characteristics of the pathogenic bacteria in milk which must be considered. All but one of the varieties of bacteria are entities, and the testing of a few strains suffices for all strains. Thus all typhoid strains

are practically alike in their resistance. The same is true for the paratyphoid bacilli, the diphtheria bacilli, the dysentery bacilli, and the tubercle bacilli. All of these, except the tubercle bacilli and some streptococci, are killed very readily by very moderate temperatures. In fact most of them when suspended in milk and placed in sealed capillary tubes are killed by exposure to 60° C. (140° F.) in 1 or 2 minutes, and all of them are killed at 60° C. for 10 minutes. Thus Walter Patzch[1] gives the thermal death point for the typhoid bacillus at 75° C. as 1 second; at 70° C., 3 seconds; at 65° C., 20 seconds; at 60° C., 1 minute; and at 55° C., 5 minutes. These results corroborate the earlier work of Rosenau, and I have also confirmed them at the lower temperatures, except that with the massive infection used a few bacilli survived for slightly longer exposures. These results are seen in Table I.

TABLE I

PASTEURIZATION

RESEARCH LABORATORIES, NEW YORK

MILK INFECTED WITH TYPHOID

Time of Heating	Temperature					
	130° F.	135° F.	140° F.	142° F.	143.5° F.	145° F.
Unheated	+	+	+	+	+	+
1 min.	..	..	..	..	+	+
2 min.	..	..	..	..	+	—
3 min.	..	..	..	..	+	..
4 min.	+	+	+	+	—	—
5 min.	..	..	..	..	—	..
6 min.	+	+	+	+	—	—
7 min.	..	..	..	..		
8 min.	..	+	—	—		
9 min.	..	..	..	..		
10 min.	+	..	..	..		
12 min.	+	—	—	—		
16 min.	+	—	—	—		
20 min.	+	—				
24 min.	+					
28 min.	—					
30 min.	—					

The term "streptococcus" however, covers a large number of varieties of microorganisms, some of which are pathogenic to man and some of which are harmless. There are two main groups, namely those that hemolyze the red blood cells and those which do not. All or nearly all diseases known to be transmitted to man through milk by streptococci are known to be due to hemolytic streptococci.

EARLIER INVESTIGATIONS

The earlier investigators of the effects of exposure to high temperature, such Sternberg, Neuman and Park, found that different strains of streptococcus pyogenes were killed after 10 minutes exposure to temperatures ranging from 130° to 138° F. Mathers[2] in 1912 found that a streptococcus from a case of septic sore throat was killed at an exposure to 125° F. within 30 minutes. Davis in 1918 found 22 varieties from human sources were killed after being heated to temperatures of 125° to 135° F. after an exposure of 30 minutes. Ayers[3] in 1918 studied a large number of streptococci as to their thermal death point. Five were killed after an exposure of 30 minutes to a temperature of 140°, 12 at 135°, 5 at 130°, and 5 at 125° F. He also obtained 6 non-hemolytic varieties of streptococci from pus from the pleura, scrotum, elbow joint and the blood of a case of endocarditis which were not killed until exposed for 30 minutes to temperatures as high as between 55° and 60° C. These are varieties, however, which are not known to have been communicated through milk to man. From Ayers and Johnson we also have the knowledge that among streptococci from udders, mouth and feces of the cow resistant strains of streptococci are found. Forty-six of 139 such strains required an exposure of 30

minutes to temperatures of 71.1° C. (160° F.) to 73.9° C. (165° F.) to cause their death. These streptococci, however, so far as known are not pathogenic to man.

STREPTOCOCCI IN MILK PATHOGENIC TO MAN

Summing up the results of these investigations we find a small portion of the strains of hemolytic streptococci which may be transmitted by milk and are pathogenic to man, are more resistant than the majority and withstand heating to a temperature of 135° F. for 30 minutes, but not one to a temperature of 140° F. for 30 minutes. The remainder are killed at temperatures ranging from 125° to 135° F. It is probably safe to say that a temperature of 138° for 30 minutes will destroy all hemolytic streptococci which occur in milk which transmit disease to man, namely, those of septic sore throat, scarlet fever, tonsilitis, and other rarer streptococcic infections. In order to determine definitely whether there are any streptococci pathogenic to man that are at all liable to be found in milk which are not killed after 30 minutes exposure to 140°, I am asking a few bacteriologists to join me in testing the thermal death point of a great many strains to different periods of exposure at temperatures between 135° and 145° F.

THERMAL DEATH POINT OF TUBERCLE BACILLI

This is of extreme importance because these bacilli are probably the most resistant of the pathogenic bacteria found in milk.

The earlier work upon this matter was quite inaccurate because tests were made of the effect of heat on tubercle bacilli suspended in milk contained in unsealed test tubes. The surface of the milk was thus exposed to the air and developed a film. This error was first pointed out by Theobald Smith.[4] He made a series of experiments extending over 18 months and published in 1899. With the care for details for which he is noted, he discovered that when milk was exposed to the air so that if even a little evaporation occurred a slight pellicle was formed of fat globules and protein and that in this tubercle bacilli were caught. As this pellicle was in contact with the air in the test tube the bacilli in it were exposed to a lower temperature than were those in the rest of the milk and they were also possibly protected somewhat by the fat and coagulated protein of the pellicle. The total effect was that these bacilli lived much longer than the bacilli submerged in the milk.

Thus, in experiment 6, tubercle bacilli exposed in water held at 140° F. (60° C.) in an open tube were killed in 15 minutes. That is, no infection followed the injection of 1 c.c. of the milk heated for this length of time or for longer periods. The bacilli heated in milk held in the open tube gave quite irregular results. The animals were negative when injected with milk exposed for 20 minutes; they were positive when injected with bacilli exposed for 35 minutes. Bacilli heated for 50 minutes were killed, but not all bacilli heated for 65 minutes. At 80 minutes all bacilli were killed. When the infected milk and water were placed in sealed and submerged tubes the irregularities disappeared. In water the bacilli were killed within 12 minutes and in milk within 17 minutes. In another experiment shorter exposures were tested. The bacilli in milk were not killed in 12 minutes, but were in 17 minutes. The bacilli in the same material exposed in culture tubes with glass caps with ventilating tubes lived for more than 35 minutes.

Another important point he noted was that the dead tubercle bacilli produced small nodules as previously shown by Prudden and Hodenpyl. Within 2 to 4 weeks they were 1 to 3 mm. in diameter. In later stages they undergo softening due to a caseation, never to suppuration. They contain readily demonstrable tubercle bacilli. Theobald Smith believed that only by the reinoculation of animals could one prevent the mistake of con-

sidering slight lesions to have been caused by living bacilli when they were really caused by dead ones.

ROSENAU ON THE TUBERCLE BACILLI

Rosenau,[5] some years later, when director of the Hygienic Laboratory of the Public Health Service, made a thorough investigation of the degree of heat necessary to kill the tubercle bacillus. Nine experiments were made with five different cultures of the bovine tubercle bacillus. The conclusion was drawn from the results obtained that "the tubercle bacillus loses its infective properties for guinea pigs when heated to 60° C. and maintained at that temperature for 20 minutes, or to 65° C. for a much shorter time." It should be remembered that the milk in these tests was very heavily infected with virulent cultures, as indicated by the prompt death of the control animals from widespread tuberculosis. Milk would practically never contain such an enormous amount of infection under natural conditions. Rosenau stated it is justifiable to assume that if 60° C. for 20 minutes is sufficient to destroy the infectiveness of such milk when injected into the peritoneal cavity of a guinea pig, any ordinary market milk after such treatment would be quite safe for human use by the mouth so far as tubercle bacilli are concerned. Rosenau's results thus agreed with those of Smith.

CAUSES OF VARIABILITY

The work of Bang is interesting in that his later work corrected his earlier less accurate conclusions. He states[6] that in his earlier work he came to the decision that, although the heating to 65° C. for 5 minutes in some cases made the milk innocuous, this was not always the case. "The same inconstancy I found for the higher temperatures, as 70°, 75° and 80° C. At that time I felt inclined to seek the reason of the inconstancy of the result by injections in variability of the tubercle bacilli, but nowadays after being guided by Smith's work I think it more probable that it has depended upon faults in the method of treating the milk. As this was done in open test tubes put into a water bath, the formation of a pellicle on the surface was not avoided, nor the formation of a layer of foam on the surface. And as no doubt the test tube was shaken a little, particles of milk may have been deposited on the sides of containers above the surface of the milk, and in this way have been protected against the heat.

"In order to avoid all these possible sources of error and to secure a thorough heating of all particles of the milk, we altered our method of heating in the way that we included the sample of milk in a thin metallic box of cylindrical form, closed with a metallic cover, in which the thermometer was fixed. The box contained 30 c.c. of milk, and when we put the whole deeply into a large water bath of constant temperature, shaking it the whole time, we were sure that no particle of the milk could avoid the influence of the heat." All tubercle bacilli were then killed by heating for 15 to 20 minutes at 60° C. Heating to the same degree for 2 minutes was enough to weaken them so much that they could not infect through the alimentary canal. Bang in his later work thus recognizes the mistakes of his earlier work and also emphasizes that the subcutaneous test is far more severe than a feeding test. His final results, therefore, agree with those of Smith and Rosenau.

PASTEURIZATION IN LOS ANGELES PLANT

We now turn to a very interesting and important practical test. Traum and Hart[7] had an opportunity to test the effect of heat on naturally infected milk pasteurized under commercial conditions such as prevail to-day in all large modern city milk plants. They were able to utilize a herd which at the time of its greatest numerical strength numbered about 500 head of cattle, all of which were tuberculous, which were under constant observation and the milk from which was allowed to be sold in

the city of Los Angeles after it had been pasteurized.

The fact thus became apparent that here was an ideal opportunity to study the effect of ordinary pasteurization on tubercle bacilli, gaining access to the milk under natural conditions in a large, well equipped, modern city milk plant.

The pasteurizing in this plant was done in a battery of three large rectangular vats, each having a capacity of 500 gallons. These vats were insulated on the sides and top with a 3-inch layer of hair felt. When the milk flowed from the clarifier into the vat, steam was turned into the water surrounding it which was circulated by means of a suction tee from the 5-inch water layer on the bottom of the vat through the coil, so that the heating surface included the entire bottom of the vat in addition to the coil area.

The milk samples were taken on different days before and after pasteurization. Twenty-three samples of the same milk, which before heating produced tuberculosis upon injection into guinea pigs, failed after pasteurization to produce tuberculosis or cause death from inoculation in a single instance. Twelve of these samples were heated above 140° F. and held for a longer period than 20 minutes. The remaining 11 were definitely known to have been heated to almost exactly 140° F. and held for only 20 minutes.

The authors conclude: "The above findings indicate, first, that pasteurization at 140° F. for 20 minutes kills tubercle bacilli in naturally infected milk and, second, that the pasteurization of milk from non-tuberculin tested cows by heating uniformly for 25 minutes at a temperature of 140° to 145° F., as provided for in the new California State Dairy Law, will render such milk free from tuberculous infection." In a later investigation Traum[8] reports in 1923 "in our experiments, milk infected with tuberculous discharge from the genital tract of a cow, when heated in sealed tubes at a temperature of 60° C. (140° F.) for 15 minutes, was no longer capable of producing tuberculosis when injected intramuscularly into guinea pigs. The same results were obtained with infected milk heated under the same conditions" for 10 minutes at 62.5° C. (144.5° F.).

Traum concludes: "Pasteurization at a temperature of not less than 142° F. (61.1° C.) and for a period of not less than 30 minutes, as required by most health departments at present, should be effective in destroying tubercle bacilli which may be present in the milk. Such exposure to heat leaves a good margin of safety. This conclusion appears justified when we take into consideration the following facts: (1) In many experiments tubercle bacilli exposed for less than 20 minutes at 60° C. have shown a very great reduction or a complete destruction of infective power. (2) Naturally infected market milk is seldom as heavily charged with tubercle bacilli as the artificially infected milks used in the experiments. (3) The viability of the tubercle bacilli in the exposure experiments was based upon guinea pig inoculation, a test much more severe than ingestion of tubercle bacilli."

OTHER EXPERIMENTS

The point has been raised that bovine strains as a whole or certain bovine strains might be more resistant than the strains used in pasteurization tests. Among others, Brown[9] has thoroughly tested this. In 1923, he found that among 25 strains of which some were of the bovine and some of the human type of the tubercle bacillus there was no appreciable difference in the thermal death point. In a more limited trial I have also had the same experience.

He found that if a temperature of 60° C. (140° F.) be used, 20 minutes exposure to this degree of heat prevents milk infected with either type of bacilli carrying infection to the injected pigs.

Before passing to my own experiments I want to mention the results obtained by R. G. White of the Lister Institute.[10] He

gives the results obtained with inoculating milk infected with tubercle bacilli from cultures, from naturally infected milk and from tuberculous tissue of guinea pigs. The results from the injection of the milk were positive before heating even when 1 c.c. of a 1/10,000th dilution was injected, while they were negative in every instance after heating to 145° F. for 30 minutes. This exposure therefore is more than sufficient to insure a non-infective milk. Furthermore, in three experiments only did he remove samples exposed for a shorter period of time, and in these three tests the samples of milk removed after 10 and 20 minutes' exposure proved also to be incapable of producing infection when injected subcutaneously into guinea pigs. The bacilli therefore were not only killed after an exposure at 145° for 30 minutes, but after exposure of 10 and 20 minutes.

TESTS AT BORDEN COMPANY PLANT

Tests of commercial pasteurization with defective and improved machines at Endicott were made at the request of the Borden Company. I believe the principal purpose of the company was to settle to their satisfaction whether the attempted exposure of every particle of milk to a temperature of between 142° to 145° F., with an absolute minimum of 142° F. for the time of 30 minutes, as required by New York City and many other cities and many states, gave a sufficient margin of safety for the different commercial machines in use. I believe the idea at first was simply to have this work done for their private information by the North Public Health Bureau. At Dr. North's suggestion the company greatly broadened their plan and invited Dr. Hugh S. Cumming, Surgeon General, U. S. Public Health Service, Dr. V. A. Moore of Cornell, Dr. M. J. Rosenau of Harvard, Dr. A. B. Wadsworth of New York State Laboratory, and me to take part in the tests. All these accepted. Dr. Cumming, however, asked Dr. Charles Armstrong to represent him and Dr. Wadsworth asked Mr. Wachter.

Dr. North and Professor E. B. Phelps, who represented the Borden Company, made all the preliminary arrangements and later had corrected the graver mechanical defects in the first machines. They were the only ones who received any compensation for their work except that some of us accepted from the company our railroad and hotel expenses. The methods employed in carrying on the tests were left entirely to us. Nothing that we asked for in the way of controls and checks was refused. There was never the slightest interference with our work. In some of the tests all of us were present, while in others some were absent.

The investigation was carried out in the same spirit as it would have been had it been conducted solely by the forces of the laboratories represented. The cultures of tubercle bacilli, the sputum from consumptives and the infected bovine tissues were supplied by the Research Laboratory of the Department of Health of New York City and the laboratory of Dr. Moore at Cornell University. Samples were frequently taken by us and they were shipped to our individual laboratories and tested by our own people. The other bacterial cultures were shipped from the Research Laboratory.

We had nothing, however, to do with the selection of the pasteurizing apparatus used in the tests. There could be no better proof that there was no attempt by the Borden Company to get us to issue a too favorable report upon the time and temperature required than the construction of two of the three pasteurizing machines we found waiting to be tested.

CONSTANT FLOW MACHINE

The first was a constant flow machine of the type developed by me many years ago to meet an emergency when New York City first demanded pasteurization

of the milk for its own hospitals and institutions. The one who got the first contract could not obtain a suitable machine at a reasonable price. The idea in my mind in suggesting the machine was that if the milk from the heater was always deposited gently on the surface of the milk filling a deep tank, which had an outlet at the bottom, it would be hotter and of less specific gravity on its entrance at the top than on its exit at the bottom.

In order to operate properly, the milk had to enter very quietly and at an almost constant temperature; the cylinder had to be high and supplied with baffles so that the currents caused by even the gentle inflow of milk would not penetrate to too great a depth and so carry a portion of the milk through the holder in a much shorter time than the average milk. Then the surface of the cylinder required insulation to prevent cooling of the milk in contact with the sides of the holder, which made this contact milk heavier and so caused downward currents. One great advantage was that there were no valves and also no foam until the very last portion was emptied. The difficulties in properly controlling all these factors are so great that one cannot be certain to get an actual holding of every particle of milk for more than half the time of the average holding, which is measured by the time taken to fill the tank or tanks. Properly constructed, and with a sufficient margin of safety, this type of pasteurizer is safe to use, but it should be gradually replaced by the perfected positive holding pocket, vat or continuous tube machine.

We found at Endicott that the holding machine of this type consisted of two cylinders, each 5 feet in height and connected by 6 feet of piping which was exterior to the holders and so was exposed to the cooling of the outside air. The heater was not uniform in its action, so that warmer and cooler supplies would follow each other making currents.

We found that some of the milk entering the machine left it within 7 minutes instead of 30. Later the temperature control was carefully regulated, but even then a fraction of the milk passed through in 15 instead of 30 minutes. Another grave defect was that the first milk to enter the machine from the heater fell to the bottom of the tank and passed immediately into the cold outside connecting pipe between the two holders.

POCKET TYPE MACHINE

The new pocket type machine was equally defective. We found that during pasteurization when we lifted a cover at the desired time and removed milk from a pocket the destruction was complete, but when we allowed the milk to discharge naturally, specimens were frequently infected.

It was not until our second series of tests that we discovered that the milk from the heater, all of which should have entered the holding pocket which was filling, partially passed by a leaky valve into the pipe discharging the fully pasteurized milk. The result was that about 1 to 2 per cent of the milk merely passed through the heater.

VAT TYPE

Even the vat type of machine was not perfect, for it was found to leak a little at the outlet valve at the bottom of the vat so that a few drops of our highly contaminated milk dropped into the discharge pipe before it was heated and so necessarily slightly infected the pasteurized milk first passing out.

The errors in construction brought out the fact that the dealers had been making their apparatus without any control by bacteriologists and sanitary engineers, and that inspection by the health authorities was not sufficiently rigid or intelligent. It is also necessary in estimating the meaning of the reports to remember that in many of the tests five different laboratories carried out the experiments and each laboratory took a number of samples for each test, so that in the con-

solidated tables, if any one of the 20 to 40 samples showed a positive result the test would be marked ineffective pasteurization and would seem to indicate the time and the temperature to be insufficient for the type of machine used, when, in fact, because the contamination of the milk was far greater than ever would occur in mixed market milk, the result showed a very striking, even if not a complete, destruction of the microbes, probably sufficient to eliminate the ordinary amount of infection in market milk. The infection was so great that in the samples infected with tubercle bacilli the control guinea pigs died from tuberculosis after injections of 1 c.c. of 1 to 1,000 or 1 to 10,000 dilutions of the raw milk, and cultures from the milk infected with typhoid bacilli before it was heated showed hundreds of thousands of typhoid bacilli in 1 c.c.

The final test was made with a pocket type machine that did not allow the inflowing milk to leak into the finished product, with a vat machine that did not leak at its outlet valve and a constant flow machine which, while altogether too low in each of its two sections, was so protected by baffles that every particle of the milk entering at a fairly constant temperature, required 70 per cent of the time of the average passage of the milk for the first to escape from the holder.

The first tests at Endicott were therefore carried out with machines with gross defects which should never have been allowed to be used, but were being used commercially. The last test was with machines which were properly made and are now being made regularly. It was partly due to the defects pointed out in the report that the U. S. Public Health Service detailed Leslie C. Frank to undertake his present most important work of testing pasteurizing machines in operation, of lessening their defects and of devising corrections which can be utilized by the manufacturers and insisted upon by health authorities.

PASTEURIZING APPARATUS IN NEW YORK

In New York City at the present time the pasteurizing machines with few exceptions are fairly well planned and built. The temperature of the milk is also closely regulated. These facts I know for, in coöperation with Mr. Thompson, Director of the Bureau of Food and Drugs, I have just had twenty of the plants tested for their working efficiency.

The fact that the disappointing results as to destruction of bacteria with the imperfect machines were so fully reported by us, would seem to me to suggest that the later satisfactory results with suitable machines with exposures to temperatures of 142 to 145° F. were dependable. After completion the report was submitted to the Surgeon General and carefully gone over by one of his experts. It was then accepted for publication as a *Bulletin*[11] of the Public Health Service. Despite all the care taken, there still occurred a few errors in the consolidated tables and perhaps elsewhere. They are corrected in Tables II and III which give a summary of the results.

The tubercle bacilli in the milk pasteurized in the vat method are necessarily exposed to gradually rising temperatures during a few minutes before the required temperature is reached. The results of the flash heating for 25 to 50 seconds to 150° F. and to 160° F. are of great interest in suggesting that with the development of methods for effective control it may be possible to allow short exposures at higher temperatures. The results of heating the milk for both 25 and 50 seconds to 160° F. destroyed all tubercle bacilli, and at 150° F. they were all killed at 70 seconds. Flash heating for 30 seconds at 148° F. greatly reduced the viable tubercle bacilli.

Recently I tested out the thermal death point of tubercle bacilli for different periods of time at temperatures which might be employed for pasteurization of milk with the following results:

THE THERMAL DEATH POINT IN MILK OF THE TUBERCLE BACILLI EXPOSED FROM 1 TO 30 MINUTES

155°	1 minute
145°	6 minutes
142°	10 minutes
140°	15 minutes
138°	20 minutes
136°	30 minutes

These results were obtained from a large series of observations and will be published in detail in a joint article with Dr. North. They were carried out with the assistance of Miss Carrie Oldenbusch.

venting the development of bovine tuberculosis in children is indicated in the results obtained by us from typing the bacilli from tubercular glands. Just before the change in the general milk supply was made in New York City from raw to pasteurized milk, we completed a study of the amount of tuberculosis due to the bovine type of the tubercle bacillus, and found that the most frequent infection was in the cervical lymph nodes.

In 55 cases of tuberculous cervical adenitis we found 21, or 38 per cent, to be due to the bovine bacillus. Several

TABLE II

COMPARISON OF EFFICIENCY OF VARIOUS PASTEURIZING MACHINES
TESTS WITH B. TUBERCULOSIS, ENDICOTT, N. Y., APRIL, 1923

Temperature Fahrenheit	Time of Holding	New Flow Type						New Pocket Type External Heater						New Vat Type Heater and Holder					
		a	b	c	d	e	f	a	b	c	d	e	f	a	b	c	d	e	f
148–150°	From heater	..	..	—	..	—	—	—	..	..	..	+	+	..	..	..	..	..	..
145–148°	30 min.	—	—	—	—	—	—	—	—	—	—	—	—	..	..	..	..	..	..
142–144°	From heater	..	..	—	..	+	+	+	..	..	..	+	+	..	..	..	..	..	..
142–142.5°	30 min.	..	—	—	—	—	—	—	—	—	—	—	—	—	..	—	—	—	—
150–160°*	From heater	..	..	—	—	—	—	..	..	..	..	..	..	..	..	..	..	..	..
142°	30 min.	..	—	..	—	—	—	..	..	..	..	..	..	..	..	..	..	..	..
138–140°	From heater	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
138–139°	30 min.	..	..	..	..	..	..	—	—	—	—	—	—	—	—	—	—	—	—
150–160°*	From heater	..	..	—	—	—	—	..	..	..	..	..	..	..	..	..	..	..	..
138°	30 min.	—	—	—	—	—	—	..	..	..	..	..	..	..	..	..	..	..	..

* Flash heat, 25–60 seconds and then cooled at once to holding temperature.

TABLE III

SUMMARY OF ENDICOTT PASTEURIZATION TESTS OF TYPHOID BACILLUS OF AUGUST, 1922, AND APRIL, 1923, USING THE VARIOUS TYPES OF PASTEURIZING APPARATUS—IN SAMPLES, EXCEPT IN VAT TYPE, PASSED THROUGH HEATER AND THEN HELD FOR 30 MINUTES

Second Series, August, 1922

Temperature Fahrenheit	Modified Flow Type					Old Pocket Type					Old Vat Type				
	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Milk held at following temperatures															
145°	+	+	+	..	—	—	—	—	..	—	—	+	—	..	—
142°	—	+	+	..	—	—	—	—	..	—	—	+	—	..	—
137°	..	..	..	..	..	—	—	—	..	—	..	..	..	..	..
136°	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
135°	+	+	—	..	—	..	..	..	..	..	—	—	+	..	—
130°	..	..	..	..	..	—	—	—	..	—	..	..	..	..	..

Fourth Series, April, 1923

Temperatures Fahrenheit	New Flow Type					New Pocket Type					New Vat Type				
	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
148°	..	..	..	..	..	—	—	—	—	—	..	..	..	..	..
146°	—	—	—	—	—	..	..	..	..	..	..	..	..	..	..
143°	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
142°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
140°	+	—	—	—	—	..	..	..	..	..	..	..	..	..	..
138°	..	—	..	—	—	—	—	—	—	—	—	—	—	—	—

At the temperature of 142° and higher the typhoid bacilli were frequently killed by passing through the heater alone.

PASTEURIZATION AND BOVINE TUBERCULOSIS IN CHILDREN

The favorable effect of the pasteurization of milk at temperatures of 142° to 145° F. for 30 or more minutes on pre- years afterwards when the general milk supply was pasteurized Krumweide typed the bacilli from 36 cases and found only 6, or 16 per cent, to be due to the bovine type. Three of the specimens came from

children who had been fed on raw milk; and two from persons who traced the infection to prepasteurization days. The sixth child gave a history of never having consumed cow's milk. She was 7 years of age. The history may have been inaccurate or the infection may have originated in eating unpasteurized butter.

In 51 cases of tuberculous meningitis in infants, Dr. Neal found 3, or 5.8 per cent, to be due to the bovine type of bacilli. In 1 of the 3 a history of having consumed pasteurized milk was obtained. Whether infected butter could have been the source of infection is doubtful. The results of these two series of tests indicate that the pasteurized milk sold in New York City is either entirely free of tubercle bacilli or almost so. To make it absolutely so it is necessary not only to have suitable regulations as to time and temperature of heating, but to have suitable equipment and operation of the pasteurizing plant. The Endicott experiment showed that with improper apparatus some of the tubercle bacilli survived an apparent but not a real exposure of 30 minutes, not only at 142° but also at 145° F.

CONCLUSIONS

The results of later investigations on the thermal death point of tubercle bacilli confirm the earlier work of Theobald Smith and Rosenau. A temperature of 140° F. for 20 minutes uniformly destroys tubercle bacilli that are thoroughly exposed to that temperature in milk. When the surface of the milk is allowed to be in contact with air which is cooler than the pasteurizing temperature, a film forms on its surface and the bacteria caught in the film are not only somewhat protected by the coagulated protein, but are exposed to a lower temperature by being held in contact with the air which is at a lower temperature than the milk and because of evaporation. Whether the infected milk is exposed to heat when contained in sealed tubes, or passes through a coil or pipes submerged in hot water, or is held in insulated tanks, the tubercle bacilli are killed at approximately the same temperature.

Models of pasteurizing machines should be submitted to sanitary engineers before they are built and should be inspected by trained inspectors. Unless these two requirements are insisted upon, machines are apt to be improperly and carelessly made and thus through leakage or improper construction permit a portion of the milk to pass through much more quickly than the regulations and safety permit. No practical regulation as to time and temperature of pasteurization would then be safe.

The results in New York City have shown that with very moderate pressure and supervision suitable machines with suitable temperature controls have been elaborated and installed. The various standards for pasteurization which have been set up by different cities have been developed through a desire to have a sufficient margin of safety to allow for the faulty operation of machines. It is as yet impossible to have the temperature so closely regulated that there will not be from time to time a change of at least 2 degrees in milk as it leaves the heater, but this difference is largely eliminated in some of the holders. An apparent rather than a real difference in the practice of many different states and cities is the fact that some actually insist on the minimum temperature being always maintained while others consider it rather as the average temperature or usual temperature. Thus, for instance, New York City requires a temperature of 142° F. as a minimum during every minute of the holding process, while some cities mention 145° F. as the temperature required, really meaning, however, that if the temperature reaches 145° F., it may fall occasionally to 143° F. or even 142° F. between times, so that actually the temperature charts of cities having these two apparently somewhat conflicting regulations are similar.

That New York City since it adopted

the temperature of between 142° and 145° F. with a minimum of 142° has no knowledge of the development of any case of typhoid fever, scarlet fever, septic sore throat or diphtheria; and, so far as tests go, tuberculosis due to bovine bacilli has markedly lessened in the population as a whole and is practically absent in those who have consumed only pas-

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be consumed freely because of its valuable properties as food, it is advisable that the pastuerizing regulations should permit the lowest temperature and the shortest time which give a margin of safety which is absolutely safe, so that its quality will be as little changed as is necessary.

The milk industry has found that if the temperature goes above 145° F. for any length of time, there is a greater change in the taste and a greater change in the cream than for milk heated at or below that point. These considerations of taste and lack of change in the milk would be absolutely insufficient to cause us to adopt a temperature which did not allow a sufficient margin of safety, but if we can obtain a sufficient margin of absolute safety with a lower temperature, it is desirable that we should

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It seems to me that health officials, bacteriologists, physicians and producers might agree upon it as fitting the facts. This definition carries out in my opinion the real intention of those who suggested the standard of 145° F. for 30 minutes.

It is, as already stated, impossible to regulate the heat and holding of the milk to keep it at an absolutely even temperature. To live up to strictly a minimum temperature of 145° F. means a tempera-

ture varying between 147° or 148° and 145° F. All varieties of pathogenic bacteria found in milk other than the tubercle bacilli and a few of the streptococci are killed within 20 minutes when exposed to a temperature of 136° F. As this is a much shorter exposure and lower temperature than kills the tubercle bacilli, any

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Milk Analysis. This report had been sent to the members of the committee in mimeographed form, and was presented by Dr. Breed for final action. Many changes in the technical details and method of presentation were discussed but no fundamental changes other than those presented to the Laboratory Section in 1925 were acted upon.

It was voted to recommend the report on Standard Methods of Milk Analysis for adoption.

It was voted to recommend to the Association that these methods be printed in the same form and on the same size paper as the report on Standard Methods of Water Analysis.

The referee on Standard Methods for Testing Disinfectants, Dr. Reddish, presented a report in which was incorporated a proposed standard method. Dr. Reddish's report was presented at one of the sessions of the Laboratory Section, and will be published in full in the AMERICAN JOURNAL OF PUBLIC HEALTH. The committee voted that the presentation of this report should be considered as notification to the Laboratory Section that final action might be recommended at the 1927 meeting of the Association. The Chairman so notified the Section at its meeting on October 12, 1926.

Meeting adjourned.

J. F. NORTON, *Secretary*

the temperature of between 142° and 145° F. with a minimum of 142° has no knowledge of the development of any case of typhoid fever, scarlet fever, septic sore throat or diphtheria; and, so far as tests go, tuberculosis due to bovine bacilli has markedly lessened in the population as a whole and is practically absent in those who have consumed only pasteurized milk; is very strong proof that the margin of safety allowed for in its requirements of at least 2 degrees of temperature and 10 minutes of time has been amply sufficient to safeguard the health of its people.

It must also be remembered that the thermal death point as shown by the development of tuberculosis in guinea pigs injected intramuscularly is very different from the attenuation death point which prevents guinea pigs from becoming infected when milk is consumed by the mouth.

As shown by Bang's and others' results, even 5 minutes' exposure of the tubercle bacilli to 140° F. will prevent the development of tuberculosis when the milk is consumed by the mouth rather than injected into the tissues of the body. This is probably the reason why in spite of early faulty apparatus and insufficient supervision, the margin of safety adopted seems to have been so satisfactory. It is of importance also that if a stray tubercle bacillus should by some accident escape death it cannot reproduce itself in milk, and alone it is probably harmless.

As it is desirable that the milk should be consumed freely because of its valuable properties as food, it is advisable that the pastuerizing regulations should permit the lowest temperature and the shortest time which give a margin of safety which is absolutely safe, so that its quality will be as little changed as is necessary.

The milk industry has found that if the temperature goes above 145° F. for any length of time, there is a greater change in the taste and a greater change in the cream than for milk heated at or below that point. These considerations of taste and lack of change in the milk would be absolutely insufficient to cause us to adopt a temperature which did not allow a sufficient margin of safety, but if we can obtain a sufficient margin of absolute safety with a lower temperature, it is desirable that we should do so. This is no appeal to lower the standards of milk pasteurization, but to urge the adoption of standards which through practical laboratory tests and actual tests of pasteurizing machines and through tests of the protection of the public have been shown to be thoroughly safe. The evidence of success of cities like New York which have for ten or more years only required that pasteurization should consist of the heating of every drop of milk to at least a minimum of 142° F. for 30 minutes (although no one would claim the regulations have always been carried out), is so convincing that that temperature should be accepted as a suitable minimum by all unless some valid objections are made. It has been suggested by the International Association of Dairy and Milk Inspectors—and this has the endorsement of the U. S. Dairy Bureau—that the following definition of commercial pasteurization might be acceptable:

> Pasteurization is the process of heating milk to a temperature of approximately 145° F., and never lower than 142° F., and holding every portion of the milk at that temperature for at least 30 minutes and then promptly cooling it to 50° F.

It seems to me that health officials, bacteriologists, physicians and producers might agree upon it as fitting the facts. This definition carries out in my opinion the real intention of those who suggested the standard of 145° F. for 30 minutes.

It is, as already stated, impossible to regulate the heat and holding of the milk to keep it at an absolutely even temperature. To live up to strictly a minimum temperature of 145° F. means a tempera-

ture varying between 147° or 148° and 145° F. All varieties of pathogenic bacteria found in milk other than the tubercle bacilli and a few of the streptococci are killed within 20 minutes when exposed to a temperature of 136° F. As this is a much shorter exposure and lower temperature than kills the tubercle bacilli, any temperature and time of exposure which suffices to destroy the tubercle bacilli is more than sufficient to destroy all other varieties of pathogenic bacteria liable to be in milk.

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COMMITTEE ON STANDARD METHODS

A MEETING of the Committee on Standard Methods of the Laboratory Section of the American Public Health Association was held at the Hotel Statler, Buffalo, on October 11, 1926. Messrs. Jordan (Chairman), Park, Wadsworth, Perkins, Harris, Wachter, and Norton were present. Dr. Breed and Dr. Reddish were asked to join the committee to present their reports.

The Chairman reported that the Fourth Edition of *Standard Methods of Milk Analysis* had been translated into French and that permission had been granted by the Executive Board of the Association for a German translation of *Standard Methods of Water Analysis*.

The main business was a discussion of the new (fifth) edition of *Standard Methods of Milk Analysis*. This report had been sent to the members of the committee in mimeographed form, and was presented by Dr. Breed for final action. Many changes in the technical details and method of presentation were discussed but no fundamental changes other than those presented to the Laboratory Section in 1925 were acted upon.

It was voted to recommend the report on Standard Methods of Milk Analysis for adoption.

It was voted to recommend to the Association that these methods be printed in the same form and on the same size paper as the report on Standard Methods of Water Analysis.

The question of "pin point" colonies was referred to the referee, Dr. Breed, for investigation and recommendations.

Through the death of Dr. Doolittle, the committee has lost its referee on Chemical Methods of Milk Analysis. The selection of a new referee was referred to Drs. Norton and Breed, a mail ballot to be taken when suggestions have been received from them.

Dr. Wadsworth presented the second progress report on the Wassermann test on behalf of the referee, Dr. Gilbert. It was voted to recommend to the Editors of the AMERICAN JOURNAL OF PUBLIC HEALTH that an abstract of this report be printed in that JOURNAL and that permission be given to Dr. Gilbert to publish the full report in some other appropriate journal.

The referee on Standard Methods for Testing Disinfectants, Dr. Reddish, presented a report in which was incorporated a proposed standard method. Dr. Reddish's report was presented at one of the sessions of the Laboratory Section, and will be published in full in the AMERICAN JOURNAL OF PUBLIC HEALTH. The committee voted that the presentation of this report should be considered as notification to the Laboratory Section that final action might be recommended at the 1927 meeting of the Association. The Chairman so notified the Section at its meeting on October 12, 1926.

Meeting adjourned.

J. F. NORTON, *Secretary*

THE TEACHING OF COLLEGE HYGIENE

JOHN SUNDWALL, PH.D., M.D., FELLOW A.P.H.A.
Professor of Hygiene and Public Health, University of Michigan, Ann Arbor, Michigan

A SESSION devoted to the discussion of this subject at the Fifty-fifth Annual Meeting of the American Public Health Association at Buffalo, N. Y., in October, 1926, was arranged by the Committee on Personnel and Training. Dr. Sundwall's contribution is the first of a series of papers developing from this session to be published. The March and April issues of the JOURNAL will carry discussions by:

Thomas A. Storey, M.D., of Stanford University, "Can College Hygiene Be Made Effective in the Life of the College Student?" and Hugh Grant Rowell, M.D., of Teachers College, Columbia University, "Laboratory Aspects of College Courses in Hygiene."

COLLEGE STUDENTS, by virtue of their educational opportunities, should become and usually do become leaders in matters pertaining to human betterment. Comprehensive and effective courses in hygiene and public health in the curricula of colleges and universities should be effective measures, therefore, in the advancement of public health; and should be matters of interest and of real concern to the American Public Health Association. This important subject has been neglected, however, by the Association and by others; and hygiene teaching has been left to fare the best it can in most colleges and universities, in the hands of agencies not adequately trained to develop and teach it.

The teaching of hygiene in our colleges, past and present, is for the most part superficial, prejudicial, confusing, unconvincing and impotent. It is not given the consideration and does not command the respect afforded other subjects in the college curriculum.

The attitude of the administration in most cases reflects the emotional attitude of people in general toward matters pertaining to health. There seems to be an assumption that anyone who is willing to interest himself in the subject or to assume the teaching of hygiene is capable of doing so. The result is that very few who are attempting to teach it have the necessary training and qualifications.

In many colleges and universities, hygiene teaching is linked up with certain activities generally regarded as being concerned primarily with student health. These activities are physical education and its outcroppings, intramural sports and intercollegiate athletics. Physical education was founded as a health measure, it is true, but this was long before many of the sciences which make up modern medicine and hygiene were conceived. Instead of incorporating in its program for health conservation measures for attention to various health factors as they have been brought out through these sciences, physical education became almost entirely engrossed in the technic of performance. Both of its offsprings—intramural sports and intercollegiate athletics—function almost wholly in the emotional field, the chief rôle of present day intercollegiate athletics being to provide students and others with occasions for the gratification of certain innate, powerful, fundamental instincts for physical emulation, competition, rivalry, and mastery. These basic human impulses can be gratified either

through actual participation in athletic contests or by a more comfortable process of transferring one's interests to a picked group of highly trained athletes who represent us in the contests.

Because of its intense instinctive and emotional appeal, intercollegiate athletics has become not only a dominating interest in college and university life but the chief bond of interest between the public at large and the college or university. When it is included along with physical education, intramural sports, and hygiene teaching, to form a student health program, it dominates the whole program.

SUBORDINATION OF TEACHING OF HYGIENE

The teaching of hygiene has suffered immeasurably as a consequence of being tied up with activities which are now dominated and controlled by these emotional influences. As an illustration, take the case of a successful football coach who had recently been appointed director of hygiene, physical education and athletics in one of our midwestern colleges. According to his contract, in addition to turning out a successful football team, he is to teach college hygiene. He asked for some good textbook on college hygiene. "You see," he confided, "I don't know anything about the subject but I've got to teach it." A talk with him brought out the fact that he had gone through college on a *laissez faire* policy. Neither chemistry, physics, biology, anatomy, physiology nor hygiene had been included in his college course. But he had contracted to teach college hygiene and moreover he possessed a profound assurance that he could do so if he could find "some good textbook" to follow. This case illustrates only too well a widespread practice of selecting teachers of hygiene.

Under these conditions the instructor, ignorant of the sciences and interests which make up modern medicine and hygiene, must rely on the old traditional methods of teaching hygiene. He loads himself, so to speak, with traditions and with empiricism which he hands out as scientific dicta. Scientific facts are usually wanting. More often than not an untrained teacher of this sort possesses a single track mind—is a faddist or hobbyist. He may be a physical culturist, an "athletics for all and all for athletics" advocate, a fresh air fiend, an anti-tobacco or anti-alcohol crusader, a "four quarts of water per day" hydrotherapist, a vegetarian, a Fletcherite, a confused Freudian, or what not. He rides his chosen hobby to the neglect of the many factors or approaches of far greater importance to health promotion and to disease prevention and control than the one he emphasizes.

In general, one may say that taking plenty of exercise, the twice daily brushing of teeth, sleeping with windows open, deep breathing, mastication *à la Fletcher*, drinking plenty of water, elimination of the body's waste matter, bathing, and sex hygiene, make up the subject matter of the average college course in hygiene as presented by this predominating type of teacher. Even this subject matter is presented in an unconvincing manner to an uninterested or even antagonistic group of students who are required to take the course and who are more or less familiar with these topics, having been inoculated with or against them while in the elementary and secondary schools. "Why, I learned all that stuff way back in the seventh grade!" was the comment of a freshman who had recently completed a college course in hygiene. No wonder, then, that by the time the boy and girl reach college they are immune to further exposure to so-called hygiene teaching.

QUALIFICATIONS OF THE INSTRUCTOR

No reform in college hygiene teaching can be anticipated unless teachers adequately trained in the sciences that concern hygiene are forthcoming. A constructive, comprehensive, and effective course can be offered only by one who is familiar with the normal vital processes. He must, therefore, be trained in those sciences through which this knowledge is

gained—physics, chemistry, and biology. Furthermore, he must be familiar with the structure and functions of the human machine, through the sciences of human anatomy and physiology. In addition to an adequate knowledge of vital processes and of normal human structures, he needs a working knowledge of pathology and bacteriology. The training so far indicated should be regarded as fundamental. To this must be added knowledge of other human interests and specialties.

Modern hygiene and public health include two major groups of interests and activities. One group is concerned with health promotion—the building up and maintenance of sound, vigorous, harmoniously developed and efficient body machines. In connection with this objective many factors must be considered. Among them may be mentioned the periodic health examination; the prevention and correction of physical defects and potential physical handicaps; the body's relation to certain poisons, bacterial and chemical; the prevention of degenerative diseases; nutrition, and like matters. In this group should be included also mental hygiene, which demands some training in modern psychology and psychiatry. The instructor must, by virtue of his training and interest, appreciate the relative values of the many factors, so far as we know them, and he must be able to give each its due emphasis.

The prevention and control of communicable diseases constitute the other group of interests. To teach this the instructor must have a working knowledge of the nature, source, and classification of diseases, routes over which communicable diseases travel and the general and specific measures for blocking these routes.

STANDARDS CHANGE

It should be emphasized here that our knowledge of the factors of health promotion and of the interests and activities necessary in disease prevention and control is *not* a *fixed* "knowledge." It develops and changes. Research and investigation along many lines are adding to it and subtracting from it. To the subject of ventilation, for example, as taught let us say ten years ago with its emphasis on oxygen and carbon dioxide content and on deep breathing, has come a newer knowledge of the body's relation to air with reference to temperature, humidity, motility and air pollution. Furthermore, who can teach nutrition and the balanced diet unless he keeps abreast with the frequent contributions on the part of research workers relative to vitamines and salts? The teacher of hygiene, therefore, must be an incessant and inveterate "follower-up" of current scientific literature, and he should incorporate in his teachings new facts as they are established. He should not only know the latest developments in his field, but he should make contributions himself, through investigation and research.

Since interest centers, now, in the individual as well as in environment, it is important that the individual be understood so far as possible; and the individual is a difficult "field" to understand. The human being presents at least four aspects or facets so far as health is concerned. These are: the anthropological, the psychological, the sociological, and the immunological. The teacher of college hygiene should appreciate these facets and the part they play and their interrelation in mental and physical health.

We must bear in mind, also, that future health work will concern itself more and more with the quality and quantity of population. Heretofore, our activities have been taken up largely in dealing with and alleviating untoward conditions of society as we have found them, with little attempt to effect a far-reaching program of prevention. Improvement of the quality of mankind is, after all, the consummate of a preventive program. The instructor of college hygiene, therefore, should be familiar with and up to date on the contributions of such sciences and interests as genetics, eugenics and population.

TEACHERS SHOULD INFLUENCE STUDENTS

In addition to adequate scientific training, vigilance in keeping up with the advancement in the various sciences and interests which concern modern hygiene, and an inquiring mind, the teacher of hygiene should be a *teacher,* with a knowledge of the principles of teaching and with the capacity and desire to influence his students to live the laws of health as we know them. Unfortunately, the spirit and atmosphere of our time are against attempts on the part of the teacher to influence students. Quoting Richard Cabot: "Teachers are in good form when they modestly present the facts, as science is supposed to, without bias. To try by our teaching to influence any student to act in any particular way would be an invasion of his rights." This dead house pedagogical attitude is utterly ineffective, when it comes to teaching hygiene. Just giving the facts about hygiene is teaching "about" it. A comprehensive, constructive, far-reaching course *in* hygiene, not *about* it, consists not only in acquainting students with scientific facts and accepted practices, but also in interesting students in applying these to their daily living; in influencing students to live the laws of health so far as we know them.

NATURE AND CONTENT OF COLLEGE HYGIENE

Socialize college hygiene—College hygiene should be presented more as a social problem than as a personal one. The personal aspects can be brought out in connection with the social aspects. It is difficult, as we know, to interest a college student in strictly personal hygiene. He has been introduced to phases of personal hygiene at intervals at least as far back as he can remember. Again, the college student, as a rule, is in the very heyday of health. If anything, he has too much of it. How can you interest anyone in something of which he has a great store! However, it is not difficult to interest students in society and its needs.

In beginning a college course in hygiene, the teacher should acquaint the student with the present conditions of our society relative to health and to disease. Our national mortality statistics, a classified list of the causes of death in the United States and the value of these statistics as range finders in health work, a consideration of the social and economic loss due to illness and to physical and mental defects as revealed by various surveys of human age groups from the preschool child on up to adults, when properly presented interest the college student and help him to understand and appreciate the need for and the interests and activities essential in public health work. A study of the relation of poverty to mortality and to morbidity, and a realization of the fact that our future security and leadership as a nation depend in a large measure upon a sound and vigorous citizenry, make for a social viewpoint and a sense of personal obligation to society.

In the study of the causes of and means of preventing or improving various conditions which contribute heavily to morbidity, untimely deaths, physical defects, inefficiency, and social maladjustments in general, the various approaches to health promotion usually presented as personal hygiene and the methods for preventing and controlling communicable diseases, community hygiene can be given due consideration. In other words, in this course in social hygiene (I am using the term "social hygiene" in a broad sense and not restricting it to venereal diseases—an unfortunate usage), we apply our consideration of personal hygiene not to the student, who feels he does not need it, but to society, in which the student is interested and which he sees does need it. Society and not the student is made the objective. In so doing the student is benefited as much as if personal hygiene were directed at him.

Every effort should be made to socialize the students, to make them realize fully society's need of them and their obliga-

tions to society; and to help them see that real success and happiness depend upon the contribution one makes in service and leadership. Moreover, the student must be led to appreciate the fact that in order to serve and lead two qualifications are essential—a trained, disciplined mind, and a high powered, efficient, energy generating body motor of the first magnitude.

Heretofore universities and colleges have emphasized the trained and disciplined mind. Not enough intelligent attention has been paid to making students realize the value of the positive health and energy maintenance factors to efficient living. When a university or college confers a degree it underwrites the young man or young woman on whom the degree is conferred. It says to society, "Here is one who is fitted to serve or to lead you intelligently and efficiently." But service and leadership on the part of the graduate will depend on the energy that his or her body machine can generate and maintain. The graduate and society are cheated, in a sense, if the college underwrites an impaired human motor which will break down soon after it enters the traffic of life, or one which because of ignorance and neglect will fall short of its possibilities.

The Projective Method—As I have tried to show, a social appeal will interest college students in hygiene and public health as a personal appeal will not; and through this approach their duties as citizens regarding both personal and public health can be emphasized. This introduces another point, teaching hygiene in a projective sense. The need of intelligent concern not only for one's health and physical efficiency to-day but also, let us say, thirty or forty years hence, should be emphasized. Of course this projective sense applies equally to society.

It is that span of life between the ages of 40 and 60 or 70 years when the individual should be of the greatest value to his community, state and nation, and to the world. Yet we know that men and women in general begin to break at the critical age of 40. Their efficiency is usually impaired. They themselves lose much of the richness of life, and society loses greatly because of these early physical handicaps or breakdowns.

I am reminded of Forrest Dryden's statistics, which are something like this—Take 100 young men in America at the age of 25, sound in body and feeling no need for health teaching and supervision. Let us project their lives 40 years hence and see what will be the state of affairs at the age of 65. Only 64 will be living, one-third of them will have died. Of the 64 living, 1 will be rich, 4 will be well-to-do, 5 will be working and thereby supporting themselves—so much for 10 of the 64. The other 54 will be dependent wholly or in part on relatives, friends, or on society in general. Such is the appalling waste of American manhood.

Students should be impressed with the fact that health can be squandered or wisely used; that the human body may be ready for the scrap heap in a short time or can be made to run smoothly and efficiently for a long period, depending in a large measure on knowledge of its structure and functions and intelligent attention to its needs. They must be helped to an appreciation not only of the need of looking ahead and attempting to so live that they themselves will have health and physical efficiency for many years of service, but also of their obligation to help make less appalling future statistics such as Dryden has compiled.

For the prevailing emotional attitude that mankind manifests towards the body, in order and out of order, must be substituted an intelligent attitude. Fears, superstitions, mysticism, prejudices and fallacious beliefs which characterize the attitude of most of mankind toward health, and permit so many cults, pseudosciences and mountebanks to flourish, must be cleared away. Students must be leaders in an intelligent attitude towards health.

Contents of the course—The subject matter of a college course in hygiene, as I have already indicated, should include

the interests and activities of health promotion and of disease prevention and control. To repeat, the need for attention to both groups of activities can be brought out through use of the findings of morbidity and mortality surveys in the various age and occupational groups. In considering causes of and ways and means of bettering conditions which contribute heavily to morbidity, physical handicaps, social maladjustments and untimely deaths, the various factors to both health promotion and disease prevention and control now known or authoritatively accepted can be emphasized.

A. In the health promotion group, among the factors to be included are:

Periodic health examinations and overhaulings
The prevention of defects and the correction of defects and potential physical handicaps as revealed by periodic examinations
Degenerative diseases, causes and prevention
Body poisons—bacterial, focal infections, drugs, chemicals, body's waste matter
Nutrition—balanced diet, quantitative needs in proteids, fats, carbohydrates, vitamines, salts, water
Sunshine—our newer conceptions of this factor in relation to diet and physical well-being
Mental hygiene—sound methods of work, study and recreation, emotional instability, psychosis, social adjustment
Air—ventilation, temperature, humidity, air movements, air pollution, climate
Clothing and shelter
Physical activity and exercise
Rest and sleep in relation to fatigue
Sex physiology and hygiene
Cancer
Heredity and eugenics and their relation to the problem of improving the quality of mankind
Accidents and injury

The results of ignorance and neglect of the various health factors and the relative values of the factors as they change with the age periods of life should be brought out.

If time permits, the special hygiene of certain organs and systems of organs may follow consideration of the factors named. Caution, however, is essential here, for much of our untoward teaching of hygiene of the special senses, organs and systems of organs has been and is largely empirical.

B. The subject of disease prevention and control should include:

Nature and sources of communicable diseases, including historical conceptions, miasmatic theories
Germs—nature of, classification, distribution; pathogenic organisms—bacteria, protozoa, parasites
Epidemics and pandemics, some historical considerations
The theory of contact infection direct and indirect
Source of infection, man the chief source, carriers prodromes, convalescents, missed cases
Classification of communicable diseases according to discharge
Routes of communicable diseases and methods of blocking these routes, including general measures and diseases for which we have special or specific prophylactic treatment

Students should be impressed with the fact that no matter how intelligently one may develop a sound and vigorous body he is not immune thereby to communicable diseases; that communicable diseases can be contracted by the strong as well as by the weak if conditions contribute to disease transmission—if one's bed fellow has active tuberculosis, for example, or if the water, milk or food supply is unsafe. Hence the need of interest in community health from a personal as well as an altruistic standpoint.

A prevailing epidemic should be cause for interrupting an arranged program of presentation and giving timely consideration to that subject.

C. Applied hygiene—the application of the principles of health promotion and disease prevention to certain age periods, units, or groups of society:

Child hygiene
School hygiene
Adult hygiene

Industrial hygiene, with particular reference to occupational diseases (of particular value to students who later on become factory administrators)

Community health, including rural, urban, state, national and international health agencies—official and voluntary

Three class periods per week for one semester is the minimum time in which this course can be offered.

LABORATORY PHASES OF COLLEGE HYGIENE

The laboratory phase of college hygiene should be humanized and should include checking up on one's physical condition, habits of living, and environment in relation to health.

A complete health examination should be required of each student in the course. A record of this examination should make up the first one or two pages of the student's laboratory note book. The next page or two should contain a list of physical defects frequently found in the student age group. Any subnormality or abnormality found in the student should be checked. Ample space should be provided on these pages for records of follow-up work and defect corrections.

Additional pages should be devoted to survey sheets of health conditions and habits, including height, weight, age tables, score sheets for health conditions and score sheets for health habits. As complete a list as we yet have of the important factors in health promotion should be included, with ample space after each item for the student's record of his personal attention thereto.

Other pages should include records and score sheets of the student's environment:

Sanitary conditions of his rooming house

Room in relation to cleanliness, ventilation, temperature, humidity, light

Boarding house with reference to the balanced diet, cleanliness, health of cooks and waiters

Class rooms—ventilation, heat, light

Campus

Community in which he lives, with particular reference to sewage disposal, water purification, milk regulations

All of these should be duly recorded and rated.

There are several excellent score sheets for recording and scoring personal health conditions, among which are those prepared by Professor Gregg for Nebraska Wesleyan University and Dr. Wood for Columbia University. Many rating sheets have appeared relative to the scoring of environmental or sanitary conditions. Every teacher of college hygiene should be familiar with the *Appraisal Form* published by the American Public Health Association for scoring the health activities in cities.

At the University of Michigan each student taking college hygiene is required to make a health survey of his home community. More than 500 surveys of communities were made last year by these students, all citizens or future citizens who will be better informed regarding community health needs and more interested in them because of these surveys.

Properly handled community health surveys in connection with hygiene courses should have far-reaching effects. They should awaken and stimulate in future community leaders an interest in community health; help them to understand and appreciate the machineries essential to an effective community health program; and lead them to a realization of their own obligations to their communities in matters that concern public as well as personal health. It is noteworthy that efficient, far-seeing health officers welcome these surveys. One could judge largely the caliber of the health officer by the reception he gave the students.

Personal survey sheets can be modified and extended to include personal observations on many phases of student life bearing on health, and can contribute to investigation and research on the part of the teacher of college hygiene. I have in mind, for example, those important studies made by the U. S. Public Health Service, by Jordan, Smiley, Barrow and others relative to colds and respiratory infections among students. Survey sheets

can be prepared whereby important studies may be made bearing on eugenics, on constitutional types in their relations to disease and abnormality, on race and disease, etc. Psychological and sociological studies can likewise be made bearing on the welfare of the student. There are many problems in which survey sheets and personal records may be utilized for studies which should prove to be of value in our newer studies of mankind. Teachers of college hygiene who have been adequately trained in physics, chemistry and biology; in the specialties of these sciences—anatomy, physiology and pathology; in psychology and psychiatry and in sociology, will find an interesting field for investigation by means of the personal survey method.

STUDENTS' HEALTH SERVICE

Wherever courses in college hygiene are offered, effort should be made to institute and maintain an efficient students' health service. Attaining and maintaining positive health and physical efficiency implies not only a knowledge of and an appreciation of the fundamentals of health promotion and disease prevention, but also certain necessary machineries. The three chief interests and activities of the college students' health service—personal attention, sanitation and education—should be understood by every student. The college health service is the forerunner of the community health center, an important and effective activity in public health work. The health service should be utilized as an important part of the laboratory phase of the hygiene courses, and students should be required to study and record its various activities. Studies should be made of the morbidity statistics, the number of defects found among students, their significance, the methods for the prevention and control of communicable diseases, and the activities concerned with sanitation.

CORRELATION OF VARIOUS ACTIVITIES

The machineries of physical education, also, should be utilized. I believe that instruction in hygiene, and the physical welfare group of activities, including physical education, intramural sports and recreational activities and the students' health service, should be correlated and organized into one department or division in the college or university. The physical welfare group of activities thereby will serve the student not only directly but also as an important teaching instrument or laboratory.

One may justly criticise the average laboratory course in hygiene as being limited too much to the study of bacteria, water, milk and food contamination and to environment—sanitation in general. These are important, of course, and must receive due consideration, but let us not forget the new public health is interested in the individual—not only in his diseases but in his normal growth and development, in his positive health and physical efficiency—hence, the importance of students making themselves, their health service, the community's health agencies and other human welfare agencies dealing directly with the individual, the subject of laboratory study and record.

CAN HYGIENE BE TAUGHT IN THE COLLEGE?

In a splendid article on "Ethics and Education," Dr. Richard Cabot, referring to the chair of social ethics at Harvard University which was created in 1919 and offered to him by President Lowell, says:

> I accepted it with enthusiasm, for it gave me the opportunity to do my bit in that effort to "put ethics on the map," an effort which then seemed and still seems to me close to the most important thing in the world. . . . But when I came to the task of preparing myself to teach social ethics—the ethics of human relations—I had to answer the objection forcibly put to me by an English acquaintance when during the summer of 1920 I settled in the ancient English hamlet of Kingham to work up my new Harvard course. Said he, "Your plans assume that ethics can be taught, but that has yet to be shown." The remark reminded me of a distinction in one of Bernard Bosanquet's essays

"Between teaching ethics and teaching *about* ethics." It is easy, as Bosanquet showed, to talk around and about the subject, its genesis, its history, its theory, its subject matter, and yet never to make anyone more ethical, never to develop any better character, any better habits of thought and action in one's pupils. That is hard and rarely attempted.

Speaking of the students in ethics at Harvard University, Cabot comments: "They took ethics as a part of general culture—to find out what it was about, not with any practical aim concerned with their own characters."

What Cabot has said about the teaching of ethics is equally true of the teaching of hygiene in our colleges and universities. Paraphrasing Bosanquet: "We talk around and about the subject, its genesis, its history, its theory, its subject matter," and yet are we making our students more healthy? are they because of their college hygiene course developing and maintaining better health and better habits of thought and actions relative to health? In general we may say that we do not teach hygiene in college. We teach about it. Personally I know of no course in college hygiene offered in this country or elsewhere which so impresses students that its contents—principles and practices—become an impelling and indelible part of their characters.

HEALTH AND CHARACTER

Health is an important thread in the warp and woof of character. And it takes character and will power to maintain health and physical efficiency. Although I have been conducting courses in college hygiene for these many years, I fear I have not succeeded in teaching hygiene, but largely *about* it. In fact, I am free to confess that the principles and practices of health in their entirety do not make up so potent an element in my own life as they should. Every day I find myself doing things that are not conducive to health, or not doing things I know to be conducive to physical efficiency. I am therefore lacking in one important element at least which should go toward making up my character. I wonder if this is not true of many or all of us.

Can we teach college hygiene from the standpoint of habit and character formation whereby health interests will become a constraining element in the daily lives of students while they still have an abundance of health? Frankly, I do not know.

The new movement in health education which centers its interests on the child when it enters school is an attempt to do this for the child. I am greatly interested in the movement and believe that principles and practices of health can be taught children in such a manner that health will become an impelling urge in the character of the child. Of course, we must await a generation or more before we can be certain of its effectiveness and lasting qualities. Teachers of college hygiene should be familiar with it.

It may interest you to hear that Mabel Bragg, Assistant Superintendent of Schools, Newton, Massachusetts, has been teaching hygiene, mind you, teaching it and not "about it," to adults at the University of Michigan Summer Session. Each student in her class, in order to get credit for the course, must take a complete health examination, must do certain prescribed daily health chores, must keep a daily score sheet of his or her health conditions and daily health habits. These adult students, ranging in ages from 40 years to 20 years, actually do these things and do them conscientiously and enthusiastically.

Concurrent with the knowledge which college students gain in the hygiene course relative to the structure, functions and care of the human body machine, to emphasize and inculcate health habits the students should be required to practice certain of the important health factors—including a health examination, prevention and correction of defects if found, proper nutrition, sound methods of study, regular habits which conform with physiological processes; and, in connec-

tion with disease prevention, the specific prophylactic measures we now have for the prevention of certain communicable diseases—vaccinations, inoculations, etc. These should be recorded on the score sheets of health conditions and habits. This "doing health" and the records thereof should make up an important part of the laboratory side of the course.

To repeat, a college course in hygiene should not only contribute to a better understanding and appreciation, on the part of students, of the *need* of intelligent attention, but influence them to *give* intelligent attention to both personal and community health. The students should be brought to see that along with education, intelligent attention to health is an essential of good citizenship. This should be brought about not by emotional appeals but by facts, and by getting in connection therewith some honest thinking. Again let us ask, can this be done? Can we teach ethics? Can we teach health?

In conclusion, may I express a hope that the AMERICAN PUBLIC HEALTH ASSOCIATION is going to be actively interested in studying and improving college hygiene teaching. This Association can do much in helping construct the contents of college courses in hygiene. It can help convince college administrators that hygiene should be given thoughtful consideration in college curricula, and that a high degree of scientific training must be required of those who give the course. It can help free college hygiene from emotional attitudes and influences that dominate it, and can help make college courses in hygiene far-reaching public health measures.

PERSONAL HYGIENE CAMPAIGN IN SAN JUAN, P. R.

Individual inspection of over 10,000 grade school children with the accompanying follow-up of cases having defects is reported* to have been the means of arousing interest of pupils and teachers as to hygienic methods of living. A minute investigation of the condition of the clothing, shoes, stockings, handkerchief, finger nails, teeth, neck, ears and hair was made of all these children. Those suspected of having tuberculosis were given observation and treatment at the department of health clinics, while children suffering from other affections were treated by the physicians in charge of school hygiene work in the emergency rooms and at the health office of the Workmen's Settlement. The majority of undernourished were children who had insufficient food because of poverty, although others lived in families ignorant of food values and basic rules of hygiene.

Of 4,000 children who kept personal hygiene rules as daily tasks following the study, 3,910 received diplomas and shield pins. A series of conferences was carried out in which prominent physicians participated. The Red Cross coöperated and furnished money for toothbrushes, clothing for the poorest children among the pupils, and treatment (including glasses) and food for other needy pupils. "A great change has been noticed in the general appearance of the school children, as well as in their state of health and in their responsiveness to good habits."

* *Porto Rico Health Review*, June, 1926.

EDITORIAL SECTION

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AMERICAN HEALTH ASSOCIATION

FROM time to time the activities of an organization called the American Health Association have come to the attention of our members. The name being similar to that of the American Public Health Association, some confusion has arisen in the minds of the public, and the activities carried on by this association have been confounded with those of the AMERICAN PUBLIC HEALTH ASSOCIATION. Since both organizations have their headquarters in New York City, the confusion has been greater.

The chief activity of the American Health Association has appeared to be the giving of free lectures on health in various cities throughout the country, at the conclusion of which a book on health through "natural methods" is offered for sale to the audience. We have no proof that the agents of the American Health Association have ever attempted to give the impression that they were agents of the American Public Health Association. Our readers should, however, be warned that there is no relationship between the two organizations, and we hope that they will utilize every opportunity possible for pointing out the distinction in purpose and practice which exists between the two organizations.

WHAT DO WE KNOW ABOUT SCARLET FEVER AND MEASLES?

FEW DISEASES have attracted more interest, or led to more discussion during the last few years, than scarlet fever and measles. While the literature shows work on these diseases in other countries, it may be said that America and Italy have led in the amount of work done, and probably also in the results achieved. Unfortunately, the results obtained by different workers in America on measles especially, cannot be reconciled, nor can the American work in general on both scarlet fever and measles be reconciled with that done in Italy. In America the work of the Dicks and of Dochez lead in regard to scarlet fever, and most bacteriologists have become convinced that the causative organism of scarlet fever has at last been identified and isolated. Toxin and antitoxin have been produced. Skin tests have been devised for which the claim is made that they indicate with great

accuracy the relative susceptibility of the individual, and apparently successful attempts have been made to control outbreaks by the use of the test and of the antitoxic serum. The serum has been recognized by our Public Health Service, is quite widely sold throughout the United States, and reports of its use are well nigh uniformly favorable.

Against this is the work of the Italian observers, chief of whom as far as scarlet fever is concerned, is Di Cristina. The organism believed to be the cause of scarlet fever isolated by this worker is not a streptococcus. So convinced are the Italian physicians in general of the accuracy of his work, that patients are no longer segregated, but allowed to occupy the same wards in hospitals when protected by a vaccine, which it is claimed renders 98 per cent of children immune against the contagion. In cities they claim to have protected all susceptible children by this vaccination, their susceptibility having been determined by the intradermal reaction of De Villa. The treatment of scarlet fever by this vaccine appears to produce results at least as good as those obtained in this country by the use of our antitoxic serums.

The results of work in this country and others prove that the hemolytic streptococcus is almost, if not quite, constantly present in cases of scarlet fever at some stage of the disease. It has been shown that the early use of antitoxic serum prevents complications and sequelae, so that the period of isolation in scarlet fever has been shortened, yet the serum has little or no effect on complications and sequelae when once established. The Italian investigators admit the practically constant presence of hemolytic streptococci which they believe to be in symbiosis with the specific organism of Di Cristina, the latter causing measles and the streptococcus producing the complications.

They point out also that the same group of hemolytic streptococcus is not isolated from all scarlet fever patients, and that identical organisms, as far as we are able to determine by culture and serologic methods, are found in healthy individuals as well as those suffering from other diseases. They deny that Koch's laws have been fulfilled, and hold that the clinical picture following the injection of hemolytic streptococci has not been proved to be scarlet fever, but resembles more closely febrile streptococcus erythema.

For many years it has been taught that scarlet fever can occur without a rash; severe angina without the cutaneous rash has been seen among contacts with scarlet fever, though severe nephritis has followed such cases. On the other hand scarlet fever has apparently resulted from exposure to severe angina. A recent study made at the Presbyterian Hospital in New York [1] seems to confirm these observations. Scarlatinal infection of the throat may occur without a rash, and may take place in individuals who show a negative Dick test, so that this test is not a reliable index of immunity to such infection. There is no antigenic relation between strains of hemolytic streptococcus from acute streptococcus pharyngitis. It has been suggested that the skin reaction is an index of antitoxic immunity but not of the immunity of the throat to invasion by the streptococcus.

In regard to measles the observations are still more conflicting. In this country, several observers, notably Tunnicliff and Ferry and Fisher, have isolated streptococci from patients. The organism of Ferry and Fisher isolated in pure culture from the blood, is an aerobe growing luxuriantly in the presence of oxygen, which they have with some ambition named "Streptococcus morbilli," though its relation to the disease has not yet been proved. However, they have presented a series of studies which they believe show the organism to be the specific

cause of measles. Skin tests performed after the manner of Schick or the Dicks give in supposedly non-immune people, positive results, while children known to have recovered from measles never react, and only two out of thirty adults with positive history have reacted. They have produced an antitoxic serum by injection with the toxin of the organism and hold that it is truly extracellular or soluble. The antitoxic properties of the serum thus produced in horses and rabbits have been proved by neutralization of toxin, both *in vivo* and *in vitro*.

The claims of the Italians are not in accord with these findings. Caronia believes that he has isolated the specific organism of measles, and the Italian physicians have such confidence in his results that measles patients are not segregated in hospital wards after immunization by a vaccine. Only 2 per cent of all vaccinated children contract the disease. The organisms have been found in desquamated epithelium, the blood, nasopharyngeal discharges, cerebrospinal fluid and bone marrow.

It will be seen that it is impossible to reconcile the findings in this country, either one with the other or with those in Italy. During the past year the editor has made every effort to present to our readers something definite concerning these diseases. Correspondence with leading pediatricians and an extensive review of the literature has not enabled him to come to definite conclusions in regard to some points concerning scarlet fever, and to none concerning measles. Perhaps the best summary of the situation at the present time has been made by Morse[2] from whose review many of the statements here given have been taken. Dochez[3] has given an excellent review of scarlet fever work.

1. Stevens and Dochez, *Jour. A. M. A.*, Apr. 10, 1926.
2. *Boston M. & S. J.*, July 15, 1926.
3. *Medicine*, 4:251–74, 1925.

HYPODERMIC MEDICATION

THE INCREASING use of hypodermic medication makes it advisable to call attention to some of the dangers incurred and to the necessity of absolute surgical cleanliness in the procedure. Tennant[1] has reported a case of gas bacillus (B. welchii) infection following an injection of atropin. Doane,[2] while pointing out the marked infrequency of infection following the hypodermic use of narcotics by addicts, has reported three cases of tetanus, and collected nine from the literature. Shaine[3] reports a case in which the hypodermic use of an arsenical preparation in a young woman brought on gangrene which ended in death. A diagnosis of erysipelas was made at the beginning of the attack.

From Germany, Schlossmann[4] comments upon a fulminating case of staphylococcus sepsis which followed the use of serum from a convalescent to protect against measles. In an article entitled "Protection Against Protective Sera," he makes a strong argument for control by the State of all protective inoculations in order to prevent such accidents.

When we consider the many thousands of injections of sera, vaccines and medicaments which are made throughout the world, it must be confessed that the procedure is very safe. However, we must agree with Shaine in pointing out that these injections are surgical procedures, which should be done with every surgical precaution.

It is necessary to administer all sera and most vaccines by the injection method, but there is no proof that hypodermic is better than oral administration in the case of many drugs. We fear that the very expert methods of salesmanship employed by manufacturing houses have induced many physicians to adopt methods of medication which have no sound basis. There is always a regrettable tendency to learn our therapeutics from manufacturers rather than from textbooks, and the samples which are so lavishly bestowed are apt to beguile even the faithful.

1. *Jour. A. M. A.*, Apr. 14, 1923.
2. *Jour. A. M. A.*, Apr. 5, 1924.
3. *Jour. A. M. A.*, Sept. 18, 1926.
4. *Deut. med. Woch.*, July 23, 1926.

ASSOCIATION NEWS

List of New Members

Florence E. Barnes, R.N., Rochester, N. Y., Nurse for Town of Greece

Jane Bellows, B.S., New York, N. Y., Director of Health Education, National Board of Y.W.C.A.

Arthur G. Bretz, M.D., New York, N. Y., In Charge of Baby Welfare Work, Borden Sales Company

P. H. Brigham, M.D., Florence, S. C., Health Commissioner

Maryella Clayton, Fort Smith, Ark., General Public Health Nursing

Smith A. Combes, M.D., Hempstead, N. Y., Health Officer

Karl F. Ehmann, Philadelphia, Pa., Conducting Private Clinical Laboratory

Lewis S. Finch, B.S. in C.E., Indianapolis, Ind., Director of Water and Sewage Department, Indiana State Board of Health

Ruggles George, B.A., M.B., D.P.H., Toronto, Can., Secretary, Canadian Red Cross Society

W. Horace Harper, Baltimore, Md., Secretary National Dairy Council of Baltimore

Katharine R. Hirst, M.A., Allentown, Pa., Instructor in Biology, Bacteriology and Physiology, Cedar Crest College

Lucien Howe, M.D., Buffalo, N. Y., Study of Hereditary Diseases, Particularly Blindness (Assoc.)

John C. Humphreys, M.D., Philadelphia, Pa., Director of Health Bureau, Penn Mutual Life Insurance Company

Alexander C. Jarvis, Copenhagen, Denmark, Specialist in Water and Sewage Purification (Assoc.)

Paul B. Marner, B.E., West Palm Beach, Fla., Assistant Engineer, Bureau of Engineering, Florida State Board of Health

Dorothy K. Minster, A.B., Cincinnati, O., Industrial Hygienist, Executive Director Industrial Health Conservancy Laboratories

Jose D. Moral, M.D., Ph.D., Guayaquil, Ecuador, Professor of Bacteriology, University of Guayaquil (Assoc.)

Teresa O'Neil, R.N., Woodside, N. Y., Supervisor Metropolitan Life Insurance Company

Grace N. Robinson, R.N., North Andover, Mass., Health Supervisor in Public Schools

P. D. Spohn, M.B., Kitchener, Can., Medical Officer of Health

Florence E. Walker, R.N., Waubay, S.D., Classes in Prenatal Care for the Division of Child Hygiene of State Department of Health

Edgar D. Wallace, A.B., Berkeley, Calif., Food Inspector, City Health Department

Frank C. Wilson, D.V.M., De Land, Fla., Sanitary and Dairy Inspector

Applicants for Fellowship

Public Health Nursing: Jean Treleaven Dillon, R.N., Charleston, W. Va.; Mathilde S. Kuhlman, Albany, N. Y.; Grace Ross, Detroit, Mich.; Cora M. Templeton, Cleveland, O.

Unaffiliated: Leon Banov, M.D., Charleston, S. C.; Frederick P. Lee, M.D., Paterson, N. J.; David B. Lepper, M.D., Boston, Mass.; Rosco Genung Leland, M.D., Toledo, O.

BOOKS AND REPORTS

Laboratory Outlines in Bacteriology and Immunology—*By John F. Norton, Ph.D., and I. S. Falk, Ph.D. Chicago: University of Chicago Press,* 1926. 114 pp. Price, $2.00.

This manual contains a well organized series of outlines of laboratory exercises covering preparation of media, microscopic examinations, pure culture methods, work with various groups of bacteria, examination of water and milk, vaccine preparation, Wassermann reactions, toxins, antitoxins, and other phases of class work. In a foreword the authors state that the time required to complete the experiments is approximately one year, but it has been attempted to make the manual as flexible as possible.

An instructor who is planning courses in bacteriology, serology or immunology, will find many helpful suggestions in these detailed outlines which occupy 110 pages. A well arranged table of contents facilitates reference to special topics of study, as does a three and a half page index. Considerable information and many suggestions as to modern methods of laboratory practice have been assembled in a small space. It may be anticipated that this book will have a wide field of usefulness by laboratory workers as well as for class purposes. I. V. Hiscock

A Doctor's Memories—*By Victor C. Vaughan. Indianapolis: Bobbs-Merrill,* 1926. 464 pp. Price, $5.00.

Biographies almost always carry the human interest story, some, of course, more than others. When one's life story is intimately connected with great advances in science and wonderful discoveries, it is doubly worth while. Such a story is the autobiography of Victor C. Vaughan which has come from the press coincidentally with his seventy-fifth birthday. Born in 1851, just before Pasteur began the publications which changed the entire face of medicine, surgery and public health, the author has lived through the most stirring times the world has ever known, a period of remarkable advancement in every field of knowledge. He saw three wars, the first when he was a young boy on a Missouri farm, but concerning which he carries some very distinct memories. He took an active part in the other two.

Dr. Vaughan was a pioneer in the development of public health in this country. He tells in a most interesting way of his early work, chiefly along the lines of chemistry, which was at that time his specialty, and how with the development of bacteriology, due to the discoveries of Pasteur and Koch, his public health investigations grew to be more and more on the bacteriological side, and he has long been recognized as one of the leading bacteriologists of this country. For this work his training was unusual and one which is too seldom seen in bacteriologists. His studies on the proteins and poisons of bacteria which he cultivated in quantities unknown before his time or since, show the value of his special training to which all of us acknowledge a profound debt.

The book is almost a history of the University of Michigan with which he was connected forty-seven years, especially the Medical Department of which he was dean for thirty years, which from its inception has stood among the first in this country, and which might well be termed a training school for professors. Among the many teachers who can point to students in whose training they have taken part, none can show so many who through their researches have added to the substantial knowledge of the world.

The author's prominence in his chosen field led to his selection for many posts of honor and brought him into touch with most of the leading scientists of the past fifty years, as well as with men prominent in other fields of endeavor. His services during the Spanish-American and World Wars brought him into close contact, not only with medical officers of the United States Army and Navy, but also with presidents and others in charge of the government, though many of his most intimate contacts were made at the University of Michigan, which has been for years a mecca for prominent people in all walks of life.

From such a book it is hard to single out important or especially interesting chapters. For those of us interested in public health we

commend his memories of the Spanish-American War, with its trying experiences with yellow fever and the dreadful epidemics of typhoid, followed by the epoch-making study of typhoid fever, by the commission of which Dr. Vaughan is the only surviving member.

To the many who have had the privilege of knowing Dr. Vaughan personally, the book will have a familiar tone, rich as it is with reminiscences and anecdotes told in the author's inimitable style, but here and there are revelations which will be new to many. The author attributes his well-known independence of thought and action to his Huguenot ancestry, who defended their freedom of thought and belief even to the extent of property and life itself.

In spite of his travels and worldwide contacts, he confesses to a dislike for residence in large cities, and his picture of heaven is "a land where each family owns its little home with a modest house, a fertile vegetable garden and beautiful flowers in bloom the year around."

Space does not permit even mention of the many features of special interest which crowd the book. The last chapter on old age is a philosophical treatise which will carry comfort to all who read it, and give confidence to many who fear that period of life. The author, in spite of his many continued activities, confesses to old age and expresses content therewith. Certainly, we know no one who can look back upon a life which has been more active or better spent, intellectually as well as practically, and though he has experienced the uncertainties and contests to which every human being is heir, he has reached this period of life with only one great sorrow, of which he speaks calmly and beautifully. His tributes to his wife are equally sincere, beautiful and deserved, as all who have the honor of knowing her will testify.

The book is the story of a man who has lived in wonderful times, who has been present and taken part in the birth and development of the sciences which above all others have contributed to the welfare of mankind, of a man who has known and traveled with many of the best men and women of his generation, of a man who has not known poverty on the one hand nor the embarrassment of wealth on the other, who has had the blessings of an especially happy home, reared a family all of whom have done credit to him, and all but one of whom remain to carry on the traditions with which they have been imbued. Would that all of us could have the confidence the author shows, and await with similar equanimity the end which must come to all of us, as he expresses it in speaking of his eldest son who sleeps in the soil of France: "but we know that his fate awaits all, and that ultimately we shall join him either in the eternal sleep or in whatever form of conscious existence the wise creator of the universe has provided for mortals when their earthly duties are ended." M. P. RAVENEL

Alcohol and Longevity—*By Raymond Pearl. New York: Alfred A. Knopf*, 1926. 273 pp. Price, $3.50.

In this book Pearl gives the results of his own experiments which have covered a period of six years, as well as those of a number of other men, some of whom have been working on the subject for as long as thirteen years. The experiments were carried out on a considerable variety of animals—guinea pigs, rats, mice, rabbits and frogs, as well as barnyard fowls and several species of insects. Without exception they all showed that alcohol has a beneficial effect upon the race, in spite of the fact that in all of them alcohol was given in excessive quantities. The beneficial effect seems to be the result of a sharp and precise selective action on the germ cells and developing embryos by which the weak and defective are killed, leaving the strong and sound to perpetuate the race.

In addition to these experiments there is included a study of more than 5,000 people in the city of Baltimore, the funds for which have been supplied by the National Tuberculosis Association, The Russell Sage Foundation and The Commonwealth Fund. The conclusions from this are that any harmful biological effect chargeable against alcohol "results solely from its abuse, and not from its reasonable and proper use."

The often quoted figures of life insurance companies are also subjected to a critical examination, which shows that, when drinkers as a class are compared with non-drinkers, the result is favorable to the latter, but when moderate steady drinkers are compared with teetotalers, the results as regards both mortality and longevity are in favor of the former. Life insurance figures do not make this distinction for reasons which are set forth. The misunderstanding which has gone abroad concerning this matter has been shown to be "because the impaired heavy drinker risks are pooled

with the actuarially superior moderate drinkers, and bring down the resulting pooled average."

Concerning the application of the conclusions to individuals Pearl declines to take any responsibility. It is a scientific study of the question and for that alone is he willing to be held responsible.

The book is well illustrated with graphs, and tables of various sorts including life insurance companies' experience tables. There are two appendices with life tables for males and females tabulated according to their drinking habits. An extensive and well selected bibliography ends the book, to which an excellent index adds an additional good quality. It can be recommended to all interested in the controversies which are going on over the prohibition question, though it contains little comfort for the extreme prohibitionists. M. P. RAVENEL

Coprologie Microscopique—*By M. Langeron and M. Rondeau du Noyer. Paris: Masson et Cie,* 1926. ii+132 pp., 129 figs. Price, 12 francs.

There has long been the need of a succinct but comprehensive handbook of coprology for the guidance of the clinical microscopist. This French treatise from the laboratories of the Medical School of Paris meets this need by its summaries of the technical procedures in stool examination for the detection of the ova or larval stages of helminths and the motile and encysted stages of the intestinal Protozoa. The work is abundantly illustrated with rather simple figures of utensils and procedures employed. Of especial interest is the rather full and amply illustrated account of the fecal contents such as plant structures from food, protozoan skeletons from filters and polishing powders, microscopic fragments of animal structures, hairs, crystals, etc., which are wont to puzzle the microscopist who may be unacquainted with a wide range of organic fragments which are met with in stools.

The common helminths and Protozoa are also figured, rather crudely, the helminths rather better and more fully than the Protozoa. We note that *Trichomonas intestinalis* is figured with three instead of four flagella and that the rather common stouter, even subspheroidal, cysts of *Chilomastix davainei* are not figured. The use of the glass staining dishes with removable trays for 10 slides is not noted. These are great time savers when much fixing and staining of fecal smears is to be done.

C. A. KOFOID

Diseases of the Teeth: Diagnosis and Treatment—*By John Albert Marshall. Philadelphia: Lea & Febiger,* 1926. 331 pp., 114 figs. Price, $4.50.

This is an up-to-date compendium of the diseases of the teeth and gums and of dental procedure in their treatment. It deals somewhat with operation and technic, but more especially with the pathological phases of the subject. Naturally, dental caries and pyorrhea occupy the leading positions but other diseases of the oral region such as Vincent's angina, thrush, carcinoma, syphilis, tuberculosis, and noma, also receive attention. The discussion of pyorrhea is especially thorough and shows how incomplete or how unsynthesized our knowledge really is of this devastating disease (or group of diseases) of the mouth. Part I deals with the dental tissues proper, Part II with the oral mucous membrane, and Part III is the laboratory section treating of pulp canal therapy and the preparation and study of dental and oral tissues in normal and diseased conditions.

The book is the product of investigation by the author and of his practical experience in dental instruction. It is not concerned with either oral hygiene or sanitation, or with conservation measures. However, those who do concern themselves with these features of health education will find in this book a concise, lucid, and thoroughly scientific and up-to-date account of the facts of dental and oral diseases, of their causes where known, their manifestations and their therapy. C. A. KOFOID

Laboratory Manual in General Microbiology, *(3d ed.)*—*By Ward Giltner. Prepared by the Laboratory of Bacteriology and Hygiene, Michigan State College. New York: John Wiley & Sons, Inc. London: Chapman and Hall, Ltd.,* 1926. 472 pp. Price, $3.50.

The third edition of this valuable laboratory manual in general microbiology, prepared by Professor Ward Giltner and his associates, represents important revisions in the light of developments since 1921. While the fundamentals remain the same, classification and certain new laboratory methods have received considerable attention. New topics include preparation of aggressin, detailed procedure for the Kahn Precipitation Test by Dr. Kahn, and an exercise on the demonstration of bacteriophage. This edition containing 472 pages should continue to prove a useful guide and reference book for laboratory workers.

IRA V. HISCOCK

Milbank **Memorial Fund**—*Report for the year ended December 31, 1925. New York: Milbank Memorial Fund.* 119 pp.

The 1925 report of the Milbank Memorial Fund contains an interesting account of the New York Health Demonstrations, together with a composite index of the reports for the past three years. In a foreword, the Secretary calls attention to the fact that much laudable social work, the value of which has been demonstrated to the satisfaction of experts, must, nevertheless, be initiated and fostered through its introductory stages by voluntary groups of individuals, sufficiently informed of its needs and of its value to sympathetically associate themselves in it. While the Milbank Memorial Fund has worked largely through public authorities, it has recognized the value of encouraging both public and private agencies seeking to improve the health and vitality of the communities concerned. "Convinced, however, that government has no more important function than that of public health conservation, the Fund has made it a condition of its participation in voluntary activities that they be under the leadership of the public officials charged with the administration of the local departments of health and education. . . . An attempt is made to keep the work at a cost which the communities may be expected to assume."

It may be recalled that the New York Health Demonstrations are directed toward ascertaining the effectiveness and unit cost of certain measures for the prevention and control of disease and for the promotion of individual and community health in three districts, typically rural, urban, and metropolitan. The demonstrations are broad in scope and are aimed toward special improvements in school, maternity, infancy and child hygiene; toward adequate provision for sanitation and food inspection; toward increased attention to the so-called degenerative diseases of adult life; and thus toward the further promotion of health conservation and life extension.

In the rural or county health demonstration in Cattaraugus County, a campaign of diphtheria prevention has been waged; a monthly bulletin has been printed; a social hygiene program has been inaugurated; a nutrition program has been adopted; and a health pavilion at the children's open-air camp in Allegany State Park has been erected. It is also noteworthy that a special bureau in the Department of Health for generalized public health nursing has been established, the expense of maintaining this work having been assumed by the County Board of Supervisors. The county health nurse is forced to travel long distances under varying conditions of roads and weather. It is not surprising, then, to find that more than one-fifth of her time must be spent in traveling to schools, clinics, district stations, and to the homes of patients. Nearly 40 per cent of her time, however, is actually spent in homes visited, schools and clinics, in addition to the work she carries on in the district stations and in coöperative visits and staff meetings.

Increased interest and participation by local officials is noted in the urban health demonstration, being conducted under the auspices of the health and education departments of the city of Syracuse, with the participation of local voluntary groups. Here is noted a change in the organization of the public health nursing of the city from a specialized to a generalized service. The year is marked by the lowest general mortality, the lowest mortality from tuberculosis, the lowest infant mortality and the lowest mortality from communicable disease in the history of the city. In addition to the extension of the school health supervision program, special health campaigns, as for toxin-antitoxin immunization and for treatment of simple goiter, have been waged. Schick tests were given in 4,804 instances and injections of toxin-antitoxin were administered in 8,696 cases during the 1925 campaign for the immunization of the children of Syracuse and of Onondaga County against diphtheria.

Through the Community Health Council, fifty-odd social and health agencies working in the Bellevue-Yorkville district of New York City are coöperating in the development of coördinated participation in the metropolitan health demonstration. A model health center building is nearing completion for the housing of the headquarters of the demonstration. The health program of services for this district is also broad in scope. "With the opening of the health center in 1926, it is anticipated that a number of new projects will be started in the district as the next step towards the inauguration there of a comprehensive community health program."

The body of the report contains 119 pages, in addition to a classified financial statement, addenda, and extensive index. The report is well printed and illustrated, and should prove of value to anyone interested in public health and community organization. I. V. H.

Outwitting Middle Age—*By Carl Ramus, M.D., Surgeon, U. S. Public Health Service. New York and London: Century,* 1926. 269 pp. Price, $2.00.

The author is inclined to regard old age as a disease comparable with chronic diseases which produce similar effects, and so believes that there is the relation of cause and effect to be found in the process of aging. This view of the matter is beautifully simple provided we can find out what causes aging, but we feel that in the light of our present knowledge, his reasoning can be applied only to premature aging. One remembers Darius Green and his flying machine, with which the only fault that could be found was that it would not fly, but persistent effort has at last solved that problem, and perhaps the problem of aging and death will eventually be solved also, though we cannot help wondering what will become of the world when nobody grows old, and the birth rate still keeps up. Indeed with the optimistic view which the author takes of the work of Steinach and Voronoff, one is appalled at the prospect and is compelled to wonder whether it will be a good thing even when we learn how.

This book is interesting reading whether we accept all that the author says or not, and while confessing freely that he says many things with which we cannot agree, or else accept only in part, we can recommend it for its optimism and the many good things which it does contain. It is well printed on light paper and contains food for thought. M. P. RAVENEL

Oeuvres de Pasteur—*Réunies par Pasteur, Vallery-Radot. Tome IV, Études sur la maladie des vers à soie. Paris: Masson et Cie,* 1926. x+761 pp., 16 col. pl. Price, $5.60.

The fourth volume of the seven projected to include the collected works of Louis Pasteur contains his entire contributions to sericulture. (See November JOURNAL for Volumes I, II, III.) He originally published in 1870 two volumes on this subject, the first dealing with pebrine and flacherie, the second, *Notes et Documents,* made up of a selection of the many papers and reports of his investigations on the diseases of silkworms and the measures to be employed in preventing them. These two works are now combined in the one sumptuous volume which is still more enlarged by the inclusion of a considerable number of articles, reports, and letters published by Pasteur between 1865 and 1870 on sericultural topics but not included by him in his *Notes et Documents.* There are also added Pasteur's writings on this subject subsequent to 1870 and a number of reports made upon his investigations by others. This collection thus constitutes a complete presentation of Pasteur's work in this field.

The fact that Pasteur was investigating the diseases of insects might at first glance seem to be a mere incidental episode in the career of this distinguished benefactor of humanity. Indeed, it is said that it seemed to him at the time a detour from his main objective, the solution of the contagious diseases of man, which even at that time had become his dominating purpose. Persuaded by his scientific advisers and friends, and actuated by a patriotic desire to assist his country in her distress, he applied himself to this, for him, quite strange and unaccustomed field, with characteristic directness and vision. The title of his report tells the story, "Études sur la maladie des vers à soie, moyen pratique assuré de la combattre et d'en prevenir le retour." He detected the probable causes of the diseases almost at once, and then spent five years of intensive work perfecting and establishing the practical methods of control and prevention, including not a little of the accessory educational persuasion necessary to make the preventive measures effective among the peasant proprietors of the "magnaneries."

The true significance of this period of his scientific career is understood when we comprehend its logical relations. He had progressed from the study of molecular asymmetry to the agency of microörganisms in fermentation, and of bacteria to the destruction of dead plant and animal substances. He had established the rôle of anaerobes. By incontrovertible evidence he had disposed once for all of the dogma of spontaneous generation as then held. He had applied his knowledge to practical ends in the manufacture of vinegar and wines. Not the least in importance, he was now in full possession of the experimental method. He believed that the causes of contagious diseases could be detected by this method.

The true significance of his work on the diseases of silkworms lies in the fact that this investigation demonstrated for the first time in the history of man's knowledge of disease, that a microörganism was concerned in its causation. He detected the inheritance of disease in the egg, solved the modes of contagion, and devised the rules for prophylaxis. Perhaps he was able

to do all this so successfully and so quickly because he was working with a short-lived insect, amenable to culture in quantity, and to a wide range of experimental manipulation, easily inspected in great numbers, and subject to infections which ran a quick course to a fatal termination. Here was an epitome of a typical epidemic proceeding on a vast scale, repeated annually. The problems and the methods by which Pasteur's master mind arrived at his solutions of the problems thus presented merit the thoughtful analysis of everyone interested in the history of scientific progress, in the experimental method, in the problems of epidemiology, and in the workings of the minds of great men. This work ultimately completely revolutionized medicine and hygiene and established new concepts of disease.

CHARLES A. KOFOID

The Importance of Diet in Relation to Health —*The People's League of Health Lectures—By various authors, with Foreword by Miss Olga Nethersole, Founder and Honorary Organizer of the People's League of Health. London: George Routledge & Sons,* 1926. 130 pp. Price, 3s. 6d.

The six chapters of this book contain the substance of a series of lectures given under the auspices of the People's League of Health at the Medical Society of London in 1925, which are published in response to the demand of the public for education along health lines.

The book opens with a foreword by Miss Olga Nethersole which gives a summary of the lectures. The article by Professor Leonard Hill is especially good. Two striking features of this series are the historical account of food and food habits given by Sir D'Arcy Power, and the emphasis laid by Dr. Rowlands on the importance of the breeding and feeding of lower animals and birds intended for human food. It is hard to go as far as he does in some of the opinions expressed, but no one can doubt the fundamental importance of his thesis.

We feel that the series would have been greatly improved by more careful editing. In some of the lectures there is much useless repetition and lack of clearness. The text is marred by a number of misspelled words such as "intestinal track," "antisceptic," "tubercule bacillus," China spelled without a capital, etc.; while here and there statements are made which no one can accept and which the author evidently did not intend, as for example, when we are told of a child poisoned by boric acid and "very nearly at death," "whose recovery was immediate when the boricised honey was withdrawn." With these exceptions the book is well printed. The names of the lecturers assure the reader of the authenticity of the scientific facts given.

M. P. RAVENEL

A Guide for Diabetics—*By Walter R. Campbell, M.A., M.D. (Tor.), Department of Medicine, University of Toronto and Toronto General Hospital, and Mame T. Porter, B.Sc., Dietitian, Toronto General Hospital. Baltimore: Williams & Wilkins.* 259 pp. Price, $2.50.

The authors have combined their experiences in treatment of diabetes and training of dietitians in a guide book. The book is a small volume of 260 pages, half of which are left blank for the notes of patient or attendant. The nature and cause of diabetes, and general food principles are discussed fully in simple language. The discussion of insulin, the dangers of insulin, and ketosis, etc., is brief, accurate, and understandable.

In the chapter discussing the structure of menus the authors have departed from the custom of printing large numbers of stock diets. Complete lists of food analyses are given, each item showing the amount in grams of protein, fat, carbohydrate in one hundred gram portions, with the energy values in calories. With the simple directions given the construction of menus by the ambulatory patient and by attendants should be very satisfactory. A large number of recipes is given.

There is an adequate chapter on urinalysis, many good hints on personal hygiene, and instructions on the canning of selected foods. A directory of firms distributing the drugs, chemicals, apparatus, and special foodstuffs is given. The book is well indexed.

This small volume may be recommended to all doctors, dietitians, and attendants in charge of diabetics. It is especially well suited for the ambulatory diabetic himself.

WALDEN E. MUNS

The Thyroid Gland—*By. Drs. Charles H. Mayo and Henry W. Plummer; Beaumont Foundation Annual Lecture Course Four. St. Louis: Mosby,* 1926. 83 pp. Price, $1.75.

This is an eminently practical little book. The two lectures contained in it are by two great masters of the subject. Much has been said and much more written about the thyroid gland and the pathological manifestations of it.

but it remained for a few men to shed definite light on the subject. Drs. Mayo and Plummer are among those men, and the substance of these two lectures is an excellent résumé of the teachings they have given us on the thyroid gland.

Section one, by Dr. Mayo, discusses the history, anatomy, physiology, and diseases of the thyroid gland in a sufficiently complete manner to bring the facts fairly before the reader. He then analyzes the statistics and draws what conclusions are possible from this analysis. Since he has had some twenty-three thousand cases upon which to base his conclusions, and since these cases have been well worked out, the conclusions are worthy of consideration. The section devoted to etiology gives a résumé of the extant theories, calling attention particularly to infection and infectious diseases.

In section two, by Dr. Plummer, using Kendal's discovery of thyroxin and of the iodine content of the thyroid secretion as a basis, he has given us a hypothesis on the cause of the symptom complex and of the development of the various types of goiter, and a treatment, which to-day are the outstanding developments in our knowledge of goiter. His well-known classification is not excelled from a practical viewpoint. It is:

1. Endemic Goiter
   - A. Diffuse Colloid
   - B. Adenomatous
     1. With hyperthyroidism
     2. Without hyperthyroidism
2. Exophthalmic Goiter.

He states that there is an unknown factor which stimulates the thyroid to activity and that in the presence of an extra amount of this stimulation, be it whatever it may, there is an inability of the gland to rise to the occasion because of an insufficient amount of iodine in the normal intake, and that the resulting thyroid secretion, being deficient in iodine, is abnormal and toxic. Logically the supplying of extra iodine corrects this deficiency, hence the brilliant results that have followed the use of Lugol's solution in toxic goiter. He goes further and outlines a large number of the ramifications of this hypothesis, all of which prove interesting, and some day may be the ground work for a more complete knowledge of the pathological thyroid.

A. G. BOWER

BOOKS RECEIVED

MODERN SCIENCE AND THE PEOPLE'S HEALTH. Edited by Benjamin C. Gruenberg. New York: Norton & Co., 1926. 250 pp. Price, $2.50.

BETTER HEALTH FOR LITTLE AMERICANS. By Edith W. Lawson. Chicago: Beckley-Cardy Co., 1926. 152 pp. Price, $.70.

LEADERSHIP. A Manual on Conduct and Administration. By William Colby Rucker. New York: Macmillan, 1926. 171 pp. Price, $2.25.

THE MODERN HEALTH BOOKS—
SCOURGES OF TO-DAY. By E. T. Burke. 166 pp.
THE AIR WE BREATHE. By James Kerr. 191 pp.
DISEASES OF ANIMALS IN RELATION TO MAN. 222 pp.
London: Faber & Gwyer, 1926. Price, $1.00 per volume.

THE PEAKS OF MEDICAL HISTORY. By Charles L. Dana. New York: Hoeber, 1926. 105 pp. Price, $3.00.

TESTS AND MEASUREMENTS IN PHYSICAL EDUCATION, 1861–1925. By John F. Bovard and Frederick W. Cozens. University of Oregon, Eugene, Ore., 1926. 94 pp. Price, $1.25.

EVOLUTION AND GENETICS. By Thomas Hunt Morgan. Princeton: Princeton University Press, 1925. 211 pp. Price, $2.00.

PRIMARY GYMNASTICS. The Basis of Rational Physical Development. By Niels Bukh. New York: Dutton, 1926. 148 pp. Price, $2.00.

THINKING ABOUT THINKING. (To-day and To-morrow Series.) By Cassius J. Keyser. New York: Dutton, 1926. 91 pp. Price, $1.00.

STUDIES IN PSYCHOLOGY AND PSYCHIATRY. Vol. I, No. 1 and 2. Edited by Edward A. Pace. Baltimore: Williams and Wilkins, 1926. Price, $5.00 per volume.

PSYCHOLOGY FOR TEACHERS. By Benson-Lough-Skinner-West. Boston: Ginn, 1926. 390 pp. Price, $2.00.

CLINICAL APPLICATION OF SUNLIGHT AND ARTIFICIAL RADIATION. By Edgar Mayer. Baltimore: Williams & Wilkins, 1926. 468 pp. Price, $10.00.

HYGIENE. A Textbook for College Students. By Florence Lyndon Meredith, M.D. Philadelphia: Blakiston, 1926. 719 pp. Price, $3.50.

THE HUMAN BODY. By Marie Carmichael Stopes. New York: Putnam, 1926. 268 pp. Price, $2.50.

HEALTH DEPARTMENT REPORTS

IRA V. HISCOCK

Montclair, N. J.—The thirty-first report of the Montclair Board of Health for 1925 is bound in light blue covers, the front cover bearing the attractive seal of the town. The inside of the title page bears the statement "Health is an asset; sickness a liability." The names of the advisory board, the director of health, the mayor, and the official staff appear on the second introductory page, followed by a brief table of contents.

A modern sanitary code was passed by the Board of Commissioners early in the year, which proved an asset in administration. It is noteworthy that "The Department of Health has had very few prosecutions during the past year, not because of a lack of violation of our code, but it is the desire of the department to assist all persons with whom it comes in contact to do the right thing—but it is the wilful violators who must be taken into court to be assured that what the Town of Montclair believes to be to its best interest must be obeyed."

The population estimated for the year was 32,308. An infant mortality rate, corrected for residence, of 49.1 per 1,000 births is recorded, and this shows a decrease of 4.1 over the previous year. An effective chart for Montclair and neighboring communities shows the infant mortality rate for the year and adds interest to the report. There were 385 deaths at all ages registered in 1925, 20 persons having been accidentally killed. One death from diphtheria was recorded, with no deaths from scarlet fever. A decrease in diphtheria cases was noted, from 40 in 1924 to 12 in 1925. Diphtheria immunization material was furnished for the school system, including the parochial and normal schools.

During the year the health department cooperated with the Montclair Tuberculosis Association in conducting an annual health examination campaign, and furnished laboratory and nursing service for those examined at the Y.W.C.A. and elsewhere. Persons found to have defects were referred to their family physician or clinic.

Formerly all birth certificates were delivered, but as only a portion of the people needed assistance from the health department, it was deemed advisable to deliver only certificates to persons desiring supervision. During 1925, therefore, 369 birth certificates out of over 600 were personally delivered. Attendance at well baby clinics is kept up by nurses' visits in the home, and by printed invitations accompanying birth certificates. An attendance of 1881 by infants and preschool children of 343 families was reported.

Progress in supervision of the milk supply is noted, while the average per capita milk consumption amounts to 0.84 pints daily. No communicable disease in the town was traced to the milk supply during the year. In the laboratory there were made a total of 1,167 microscopical examinations for disease diagnosis, with 966 bacteriological and 565 chemical analyses of milk and 776 analyses of water.

Illinois—The eighth annual report of the Illinois Department of Public Health for the year ended June 30, 1925, is a volume of 248 pages, representing an immense amount of careful work. The report is bound in gray covers, the front cover bearing the seal of the state. One introductory page is properly devoted to the organization of the department, with the names of division chiefs. The director's report is one of progress and emphasizes modern tendencies in the public health administration field. "Further progress in popular health promotion will depend more and more upon active public support since it will involve increasingly the individual application of sanitary and hygienic tenets such as those relating to personal cleanliness, dietary regimens, immunization, habit and preventive medical service. Advantage has been taken of proffered coöperation by the state medical and dental societies, women's clubs and other extra governmental agencies."

The state legislature passed two bills of significance during the year. One of these provides for the standardization and certification of milk pasteurization plants and the other enables municipalities to levy a tax for producing funds with which to employ public health nurses. Enactment of the new law relating to milk supervision had the support of the milk dealers. The department was active in the development of measures

to insure the future safety of shellfish and the protection of the public on a nation-wide scale. Practically all oyster producing states from coast to coast are reported to have taken comprehensive steps to meet the requirements. The effective services of the department in tomato rehabilitation in March, 1925, are briefly described.

Health conditions in the state are reported as comparatively good, with lowered communicable disease incidence, particularly of diphtheria. A general death rate of 11.2 per 1,000 population was recorded. Definite increases in mortality are reported from chronic nephritis, cerebral hemorrhage, cancer, arteriosclerosis, and violence.

The report is well illustrated with photographs of sanitary devices and activities of the department, numerous tables, and graphs. These illustrations supplement the text and add to the interest of the report.

Connecticut—The fortieth report of the State Department of Health for the year ending June 30, 1925, is bound in black cloth covers and contains 389 pages, exclusive of an extensive subject index at the back. The report is well arranged, illustrated with numerous tables, graphs, and photographs, and printed in good readable type. It is worthy of study by health administrators.

In 1924, Connecticut had a population of 1,502,405, a death rate of 11.3, and a birth rate of 21.1 per 1,000 population. An infant mortality rate of 68.7 is noted in comparison with a rate of 91.9 in 1920, and 127 in 1910, "a truly remarkable reduction at which official and non-official health workers can look with pride and feel justified in their requests for further funds to carry on their work to save infant life."

One of the features of Connecticut reports for recent years has been the analysis of health dividends in cash values. The method of the National Conservation Commission has been used in estimating the financial loss due to deaths at various age periods, and these figures seem very conservative in the light of present values. The average deaths for the five-year period, 1915–1919, are given, and the 1923 and 1924 accounts are compared with the former to show the progress being made in connection with control of the majority of diseases. The preventable loss in each of the years 1923 and 1924 was much less than for the previous period, and for 1924 the net savings represented by lessened deaths amounted to over $5,000,000. This figure, of course, as pointed out in the report, refers only to deaths, and does not include any of the sickness saving in money value as could be shown in hospital, physician and nurse costs, and loss of wages during illness, or of labor to employer. The expenditures for the fiscal two-year period ending June 30, 1926, amounted to $199,768. Reports of division chiefs have been carefully prepared, and contain much information and several valuable suggestions concerning administrative procedures and results.

Winnipeg, Man.—The medical officer of health of Winnipeg indicates at the beginning of his 1925 report the most important statistics for the year, followed by a fianancial statement. This procedure of devoting at the outset one page to the outstanding figures for the year, with another page or more for financial data, is commendable. The departmental expenditure per capita amounted to 65.2 cents.

On the basis of an estimated population of 195,148, a crude death rate of 8.3 is recorded. An infant mortality rate of 68.0 per 1,000 live births was only 0.2 higher than the rate for the previous year, which was the lowest on record for this city. It is emphasized again that the majority of infant deaths now occur, not from gastrointestinal infections, but from pulmonary diseases, inanition, and congenital defects, and most of them occur during the first week after birth.

Prenatal care is rendered by the General Hospital and the Children's Hospital; by the Victorian Order of Nurses, and by the Child Welfare Division of the health department.

The dangers of whooping cough are wisely stressed in this report, which shows that during 1925, this disease in Winnipeg was responsible for as many deaths as were caused by measles and scarlet fever combined. "This disease is not taken seriously enough by many parents, either from the viewpoint of safety of their own children or those of others."

A table showing the extent of pasteurization of milk in 15 cities of Canada indicates that 100 per cent of the supply is pasteurized in Windsor and Saskatoon, while over 99 per cent is pasteurized in St. John and Toronto, with 98 per cent pasteurized in Hamilton and 97 per cent in Ottawa. In Winnipeg, 54 per cent of the supply is thus treated. The detailed analysis of the milk situation from the standpoint of milk consumption, supervision, and results, is one of the best features of the report.

Fall River, Mass.—During 1925, the health record of Fall River is reported favorably. The total deaths from all causes have been less, the crude rate for the year being 12.25 per 1,000 population. The estimated population of 129,662 was slightly lower than in 1924, "due to the industrial depression." The infant mortality rate of 90 per 1,000 live births was the lowest yet recorded for the city. A classified financial statement indicates a net health department expenditure for the year of $111,995.

The report of the director of school hygiene indicates progress in the extension of this service and decreased exclusions during the last 5 months of the year as compared with the first 5 months. A total of 13,264 home visits was made by school nurses, a large proportion of them having been made as follow-up visits in the homes to explain and persuade parents to correct conditions found as a result of medical examinations and physical inspections. "Monthly weighing with notices to parents of 'underweight' children and bi-monthly weighing of 'underweight' children are not recommended by the Director except as this service can be given with definite health education projects to interest the children in proper diet and health habits to promote improvement of their condition. Without satisfactory educational measures such frequent weighing becomes a burden upon the teacher that becomes irksome because of lack of results attending."

South Carolina—The State Board of Health of South Carolina has published its 46th annual report for the year 1925. The report is printed in readable type and is timely. It indicates outstanding problems as well as progress, and concludes with a classified financial statement for each bureau. The chairman's report states that no important epidemic occurred during the year except infantile paralysis which prevailed during the summer. Attention is also directed to increased mortality from pellagra (408 deaths), and to diseases of the circulation (4,207 deaths), and of the kidneys (1,578 deaths), as compared with 1,318 deaths from all forms of tuberculosis. During the year 1,081 people were given anti-rabies treatment.

Sixteen counties had whole-time health departments, including over half the population of the state. One of the activities in rural hygiene is the conduct of dental clinics, in which 42,025 children were examined, and 30,706 fillings, cleanings, and extractions were performed. The total amount of free work done amounted to $3,082 and the amount collected, $12,271 for these dental services. Intensive work is also reported in the instruction of midwives, in the conduct of well-baby clinics, and in general education. A State Orthopedic Surgeon has developed a program for "restoring the crippled children of the state to useful citizenship." Improvement in the sanitary condition of hotels and restaurants is reported since inspection service was organized. The cost of this work is borne by the hotels and restaurants inspected.

Haverhill, Mass.—The 1925 report of the Haverhill Board of Health is bound in light gray covers, the front cover bearing the city seal. Inside the title page are listed the primary statistical facts for the year. The population, according to the state census, was 49,232, and the crude death rate, 14.07 (excluding nonresidents, 12.89). An infant mortality rate of 64.99 is recorded. Two pages are devoted to the organization of the board of health and the department. Composite reviews of the various activities of the department for 1925 have been inaugurated in this 46th annual report, which also contains a compilation of the mortality statistics classified by sex, nativity, social relationship, age, deaths by months, and residences by wards. An increase in crude death rate is accounted for by a "decrease in population; the state census last year showed a population of 49,232, a loss of 4,652 in five years, and the result of the business depression which Haverhill, as well as other industrial centers, has passed through in the last half decade."

The per capita expenditure in 1925 amounted to $1.09, as compared with 67 cents in 1924. The increased expenditure was chiefly due to the assumption by the department of the cost of hospitalization of tuberculosis patients at the county sanatorium. It is gratifying to find a carefully prepared financial statement with per capita costs classified according to functions. Another feature of interest in the report is an analysis of causes of death, with summaries and rate, from 1885 to 1925 inclusive.

South Dakota Public Health Association—The report of the South Dakota Public Health Association for the fiscal year ending June 30, 1926, has appeared in mimeograph form. This report calls attention to notable progress in public health work in the state during the past 14 years, including the establishment of a State Tuberculosis Sanitarium and the extension of the activities of the Department of Health.

The program of the association centers around local committees of which there are sixty-five. Twelve counties have used their Christmas Seal funds to finance short time or itinerant nursing services. Twenty county committees operated and promoted programs on May first. The State Association at that time provided more than 3,000 pins with the legend "I am Examined, Are You?" which indicates that at least this number of children were examined by their family physicians during that week.

National Committee for the Prevention of Blindness—The 1925 report of the National Committee for the Prevention of Blindness is well printed in good readable type and bound in soft yellow paper covers. On the front cover, beneath the picture of an attractive baby with arms outstretched, is the commendable expression of an objective "Good Eyesight—the Birthright of Every Child."

The function of this organization as defined in the report is "to keep abreast of the scientific advance in ophthalmological knowledge of refraction, disease and operation; to inform the public generally in layman's language of such advance, and the ways in which such knowledge and practice may be made available to the public, together with what action, public or private, on the part of the community or private organization will provide the means for professional ophthalmological assistance."

Lewiston, Me.—The sixth annual report of the Lewiston Health Department is well printed and contains interesting material for this city of 37,000 people. Following a well-arranged title page is given the organization of the department, together with the most important statistics for the year. A crude death rate of 16.4 and an infant mortality rate of 117 are recorded. Of 117 infant deaths, 76 were less than one month of age. The expenditures for health department work were $11,377, with $4,996 additional for garbage collection. The health officer's report concludes with recommendations for future development, including a statement as to the need and value of an isolation hospital.

A SELECTED PUBLIC HEALTH BIBLIOGRAPHY WITH ANNOTATIONS

RAYMOND S. PATTERSON, PH.D.

The Nature of Vaccinia—The virus of poultry pox is found, by immunologic tests, to be distinctly different from vaccine virus.

ANDERVONT, H. B. The Relationship of the Epithelioma Contagiosum Virus of Fowls to the Vaccine Virus. Am. J. Hyg., 6:6 (Nov.), 1926.

Goiter Prophylaxis—An English summary of the goiter question, in which the indiscriminate use of iodine as a prophylactic agent is deprecated.

ASH, W. M. Goiter. J. State Med., 34:11 (Nov.), 1926.

Malaria Prevention—The effectiveness of screening, quininization, and education as antimalarial measures in regions where the presence of Anopheles is inevitable is set forth by the authors.

BARBER, M. A., et al. Malaria in the Prairie Rice Regions of Louisiana and Arkansas. Pub. Health Rep., 41:45 (Nov.), 1926.

Nutritional Economics—An unusual consideration of dietetics (that of cost) is found in this discussion of the factors upon which the diet of poor people must be judged.

BOND, MURIEL. Scientific Dietetics and Working Class. J. Royal San. Inst., 47:5 (Nov.), 1926.

Pneumococcus Antibodies—Experimental pneumococcus infections in animals confirm clinical findings that pneumonia mortality usually follows a septicemia, and that pneumococcus antibodies are efficacious in counteracting pneumococcus septicemias. A hopeful and stimulating paper with which all health officials should be familiar.

BALDWIN, H. S., and CECIL, R. L. The Rationale of Specific Therapy in Pneumococcus Pneumonia. Jour. A. M. A., 87:21 (Nov. 20), 1926.

Infant Supervision—Child hygiene workers will be interested in the details of the infant-welfare program carried on by the City of Chicago.

BUNDESEN, H. N. Saving Babies Through Education and Personal Contact. Nation's Health, 8:11 (Nov.), 1926.

Disease Prophylaxis and Therapy—The therapeutic and prophylactic administration of the several biologic products are covered in the textbook manner. Useful for the purpose intended, but of limited value for health officials.

CLOCK, R. O. The Use of Vaccines and Sera in Communicable Diseases. M. J. & Rec., 124:10 (Nov. 17), 1926.

Variation in Pathogens—In his Sedgwick Memorial Lecture, Chapin traces the spread of mild and virulent smallpox, and considers the recent decrease in virulence of scarlet fever. The change in type of smallpox he believes to be a sudden mutation; in the instance of scarlet fever, he believes that the transition was slow. An exceedingly interesting and stimulating paper.

CHAPIN, C. V. Changes in Type of Contagious Disease: With Special Reference to Smallpox and Scarlet Fever. J. Prev. Med., 1:1 (Sept.), 1926.

Tonsil Clinic Difficulties—The administrative difficulties confronting the health official who would have removed all offending tonsils and adenoids are set forth effectively in this paper.

COX, G. H. The Tonsil and Adenoid Problem in Nassau County. New York State J. Med., 26:22 (Nov. 15), 1926.

Tuberculosis Clinics—The importance of diagnosis and preventive educational measures is emphasized in this paper, which recounts the work of the Lancashire (England) tuberculosis officer.

COX, G. L. The Diagnosis and Prevention of Tuberculosis as Functions of a Tuberculosis Dispensary. Med. Off., 36:19 (Nov. 6), 1926.

Botulism Research—A review of the present knowledge of the pathogenicity, toxicology, and immunology of the *Cl. botulinum* organisms is given to indicate the need for clinical and laboratory investigations.

DICKSON, E. C. The Present Status of the Botulism Problem. J. Prev. Med., 1:1 (Sept.), 1926.

Bacteria in Oysters—A study of the bacterial content of shell oysters in Baltimore revealed a large number of organisms. These were divided into five principal groups: colon-aerogenes, streptococci, "water-bacteria," anaerobes, and incidental organisms.

ELIOT, CALISTA. Bacterial Flora of the Market Oyster. Am. J. Hyg., 6:6 (Nov.), 1926.

Prenatal Supervision—Mark Twain said that the weather is a subject of endless discussion about which very little is done—and antenatal supervision, in most places, is in the same category. This paper is the story of a clinic in which something is done. The author believes that prenatal clinics should act principally for cases referred by midwives and should be in the care of practicing obstetricians, not whole-time officials.

EVERS, H. H. Ante-Natal Work. Pub. Health, 40:2 (Nov.), 1926.

Typhoid Fever Fatality—A statistical analysis of the typhoid fever statistics of Chicago (1912–1925) during periods of high and low incidence of the disease shows a tendency for the fatality rate to decline, but not in proportion to the reductions in prevalence.

FALK, I. S. The Fatality of Typhoid Fever in Chicago. J. Prev. Med., 1:1 (Sept.), 1926.

Measles Convalescent Blood—In the experience of the New York City Department of Health, measles convalescent plasma greatly mitigates, when it does not prevent, measles after exposure. Its greatest usefulness is in institutions and for delicate children. As the author reviews the work of other investigators, it is regrettable that he gives but passing notice to the promising work of Tunnicliff and Ferry. In addition, the reporter has garbled the names so that they are scarcely recognizable.

FREEMAN, R. G. Measles Convalescent Blood as a Therapeutic Agent—Its Status. Am. H. Congress Series, Vol. 2, Part 1 (Trans. of 3rd Annual Meeting, Am. Ch. H. Assoc.), 1926.

Epidemic Encephalitis—Clinical studies indicate the persistence of infectivity on cases of encephalitis long after the acute stage has passed.

FREEMAN, WALTER. Chronic Epidemic Encephalitis. Jour. A. M. A., 87:20 (Nov. 13), 1926.

Health Examinations—A survey of 100 business men shows a high ratio of definite impairments and organic defects. The scope of the "vital" protective examination is outlined, and its value emphasized.

FISK, E. L. The Value of Complete Routine Examinations in Supposedly Healthy People. Boston M. & S. J., 195:16 (Oct. 14), 1926.

Water Bacteriology—A comparative study of a number of culture media leads the authors to conclude that the neutral red medium is the best so far proposed as a presumptive medium for the coli-aerogenes group.

GEORGIA, F. R., and MORALES, R. The Diagnostic Value of Neutral Red Lactose Peptone Media for the Coli-Aerogenes Group. J. Am. W. W. Assoc., 16:5 (Nov.), 1926.

Cancer Studies—The existence of a virus and an activating substance in neoplasms is convincingly told by Gye, who restates his finding of an agent in tumors of diverse origin, which reactivates a Rons sarcoma extract which had been inactivated by means of an antiseptic. The paper should be read by sanitarians who wish to be informed on the cancer question.

GYE, W. E. The Cancer Problem. Lancet, 2:20 (Nov. 13), 1926.

Sheppard-Towner Act—This article describes briefly the educational work in child hygiene carried on in 43 States during the past five years with the aid of Federal funds. Important information for health officials at this time, for the decision whether or not to extend the appropriation will be decided by the present session of Congress.

HAINES, B. M. and MARSH, E. T. Four Years of the Federal Maternity and Infancy Act. Nation's Health, 8:11 (Nov.), 1926.

Kahn Test—The author claims for the test the advantages of saving time and the use of a stable antigen.

KAHN, R. L. Simplifying Syphilis Control by the Kahn Test. Nation's Health, 8:11 (Nov.), 1926.

Milk Pasteurization—An English opinion of the pasteurization research in the United States, chiefly about Bulletin 147, U. S. P. H. S. Compulsory pasteurization of all but certified milk, the requirement of many American cities, is urged by the author for English milk supplies.

KENWOOD, HENRY. The Trade Pasteurization of Milk and the Public Health. J. Royal San. Inst., 47:5 (Nov.), 1926.

Scarlet Fever—Kolmer has given a scholarly discussion of the value and applicability of the Dick test, immunization with scarlatinal toxin, both prophylaxis and treatment with antitoxin, and the Schulz-Charlton reaction. The many technical difficulties encountered in administration are wisely omitted, so that the paper is useful as a guide to the health official who teaches his public.

KOLMER, J. A. Biologic Therapy in Prophylaxis and Treatment of Scarlet Fever—Its Practical Value. Am. H. Congress Series, Vol. 2, Part 1 (Trans. of 3rd Ann. Meeting, Am. Ch. H. Assoc.), 1926.

Tuberculosis Prophylaxis—The work of Calmette and others in the vaccination of children with living attenuated tubercle bacilli is reviewed. The paper includes, as well, a summary of attempts to produce immunity with killed cultures of the tubercle bacillus, and considers the relationship between immunity and skin sensitization.

LONG, E. R. Protective Vaccination of Children Against Tuberculosis. J. Prev. Med., 1:1 (Sept.), 1926.

Rural Health Administration—A description of the 89 coöperative rural health projects of the service. The summary of accomplishments makes an impressive showing.

LUMSDEN, L. L. Coöperative Rural Health Work of the Public Health Service in the Fiscal Year 1926. Pub. Health Rep., 41:43 (Oct. 22), 1926.

Goiter and Absenteeism—Sixth grade pupils with thyroid enlargements had a slightly better attendance record in one city over a six-months' period than thyroid-normal children. An interesting study not offered as conclusive evidence.

OLESEN, R., and TAYLOR, N. E. Endemic Goiter and School Absenteeism. Pub. Health Rep., 41:44 (Oct. 29), 1926.

Tuberculosis Infectivity—A worth while study indicates that latent tuberculosis in a member of a family is spread to both children and adult members of the family.

OPIE, E. L., and McPHEDRAN, F. M. Spread of Tuberculosis Within Families. Jour. A. M. A., 87:19 (Nov. 6), 1926.

Community Health—"Shall health service be organized about a function, such as the care of the child or the prevention of tuberculosis, or shall it be organized around a series of local regional units?" An interesting discussion of the place of the polyclinic in public health.

WINSLOW, C.-E. A. Strategic Position of the Dispensary in the Public Health Campaign. Nation's Health, 8:11 (Nov.), 1926.

Diphtheria Immunization—With an experience covering more than a million Schick tests, Dr. Park speaks with authority. Although most of us are familiar with his findings, all will find this latest summary useful as reference, for it covers the entire field with the possible exception of the place of detoxicated toxins in diphtheria prophylaxis.

PARK, W. H. Some Important Facts Concerning Active Immunization Against Diphtheria. Am. H. Congress Series, Vol. 2, Part 1 (Trans. of 3rd Ann. Meeting, Am. Ch. H. Assoc.), 1926.

Nutrition Programs—The story of some of the nutrition programs carried on by Red Cross workers may prove of value in inducing other communities to undertake this important health work.

SCHUMAN, C. B. Rewards Earned by Knowledge of Nutrition Applied. Red Cross Courier, 5:22 (Nov. 15), 1926.

Diphtheria Prevention—Probably the most completely reported of any community health program, the Auburn experience in diphtheria prophylaxis cannot be retold too often. The latest summarization is particularly effective because the practicability and value of wholesale immunization are so completely proved.

SEARS, F. W. Diphtheria Immunization Results in Central New York. Am. H. Congress Series, Vol. 2, Part 1 (Trans. of 3rd Ann. Meeting, Am. Ch. H. Assoc.), 1926.

School Epidemics—Some common sense criticisms of the Rules of the Society of Medical Officials of Schools (England) are included in this article; but no mention is made of the use of the laboratory or of immunization against infectious diseases.

SIMEY, A. I. The Management of Infectious Diseases in Boarding Schools. Lancet, 2:21 (Nov. 20), 1926.

Diphtheria Immunization—Another account of the diphtheria immunization work in Auburn, told this time from the viewpoint of the practicing physician.

SINCERBEAUX, G. C. Auburn's Experience with Toxin-Antitoxin. New York State J. Med., 26:20 (Oct. 15), 1926.

Whooping Cough Clinics—A comparison of four groups of whooping cough cases, one receiving vaccine alone, another X-ray alone, a third a combination of the two treatments, and a control group under the usual medical treatment indicates the superiority of the combined treatment. The X-ray treatment is discussed.

SMITH, L. W. The Present Status of Whooping Cough. Pub. Health Nurse, 28:11 (Nov.), 1926.

Tuberculosis After-Care—The need for a rational system of exercises to fit the convalescent tuberculosis patient for his return to active life is discussed in an account of this type of work carried on in an English County Health Unit.

RAE, H. J. Remedial Exercises in the Treatment of Tuberculosis. Med. Off., 36:18 (Oct. 30), 1926.

PUBLIC HEALTH NOTES

Professor Turner to Direct Work in Cleveland—Professor C. E. Turner of the Massachusetts Institute of Technology has been granted a six months' leave of absence in order to develop a devision of health education for the city of Cleveland, Ohio.

Plumbing and Heating Industry Meet—The third annual three-day institute of the Plumbing and Heating Industry will be held January 18-20 at the Carnegie Institute of Technology, Pittsburgh, Pa. The institute will be conducted by the Department of Industrial Relations with the coöperation of the Department of Plumbing, Heating and Ventilating.

Fourth Annual Texas Short School for Sanitarians—The American Public Health Association was represented at the Fourth Annual Texas Short School for Sanitarians and Health Workers held at Fort Worth, Texas, in October. Homer N. Calver, executive secretary of the A. P. H. A., and W. F. Walker, D.P.H., field director for the Committee on Administrative Practice, were in attendance.

The matter of considering arrangements to provide a full-time organization in coöperation with the A. P. H. A. was taken up by the executive committee.

Officers elected were: Dr. L. H. Martin, President; C. C. Hays, First Vice-President; C. M. Adams, Second Vice-President; E. W. Steel, Third Vice-President; and Bud A. Randolph, Fourth Vice-President; also Dr. A. H. Flickwir, Representative of the Governing Council, A. P. H. A.

The following officers were appointed by the executive committee: E. G. Eggert, Secretary and Treasurer and the Advisory Council members: C. N. Avery, Dr. Holman Taylor, Dr. H. O. Sappington, H. W. Van Hovenberg, Mrs. Margaret Conger, V. M. Ehlers, Dr. C. N. Rosser, Richard P. Hall, L. O. Bernhagen, Dr. A. H. Speer, Dr. W. A. King, Dr. A. H. Flickwir, and Homer N. Calver.

New Director of Publications—Geddes Smith, formerly managing editor of *The Survey*, has been appointed director of publications of the Child Health Demonstration Committee, which administers the Commonwealth Fund Child Health Program.

Mr. Smith remains an associate editor of *The Survey*.

PUBLIC HEALTH ADMINISTRATION

HENRY F. VAUGHAN, D.P.H.*

"Dipped Milk Outlawed"—The Bulletin of the Syracuse Health Department reports that the sale of milk from bulk containers to the ultimate consumer was discontinued in that city beginning January 1, 1927. It had been found that 50 per cent of the dipped milk sold in restaurants did not meet with the standards of the sanitary code. The action of the Syracuse Health Department is in harmony with progressive steps which are being taken in many cities in an effort to assure the consumer that he is being sold a fluid milk of legal butter fat and cream standard.

Committee on Administrative Practice—A meeting of this committee was held in New York City on November 22, 1926. Several major projects had been referred during the past year to appropriate sub-committees. The sub-Committee on Health Service Record Forms reported that it had completed a portion of its task by preparing suggested forms to be used for nursing service, communicable disease practice, laboratory service, and school medical service. It was voted that this report be published and be made available for experimental use by health officers as soon as feasible. The purpose in mind is to make available the best practice in these various fields, and to make it possible for administrators to take ad-

*Address all communications relating to this Section to the Associate Editor at Department of Health, 1300 Beaubien Street, Detroit, Mich.

vantage of the experience of others which has been incorporated into these printed forms, which, if adopted as standard practice, will do much to harmonize procedure in different municipalities and make it possible to draw comparisons of similar service in various localities. It is anticipated that this report will be received with the same degree of confidence and support as marked the reception of the *Appraisal Form*, which has stimulated such widespread interest. The forms are not presented at this time with finality and preciseness, but rather so that their application through a widespread adaptation may result in the accumulation of new experience and helpful comment.

The sub-Committee on Appraisal Form for Rural Health Work held several meetings during the past year which resulted in the formulation of an appraisal form which in fundamentals is not unlike that which is now being applied to cities. Authorization has been made for the publication of this document with the understanding that the form will carry a statement that it is intended for experimental purposes and has not yet been approved by the Committee on Administrative Practice. This tentative appraisal form is the product of much deliberation and consideration on the part of administrators who have been actively engaged in the field of rural health during the past several years. It, therefore, represents the judgment of practical health officers who do not feel, however, that their experience has enabled them to take into consideration every possible contingency and development which has been brought forward in this field of specialization. The experimental application of the document will doubtless stimulate interest and attention which will necessarily result in criticism and comment with the ultimate conclusion that some changes will have to be made. The case is quite parallel to that which attained under the preliminary application of the city appraisal form. Standardization of procedure and comparative studies of results obtained will finally dictate the formulation of a schedule which can be placed before the health administrators as a general guide and expression of group judgment.

The Committee on Administrative Practice has formulated a sub-Committee on the Relationship Between Health Departments and Hospitals. Preliminary investigations and questionnaires indicate the need and advisability of pursuing this study more systematically. With that end in view funds have been placed at the disposal of the sub-committee for the purpose of making further studies which will not be of an elaborate character, but carried on largely by the questionnaire method.

The Committee on Administrative Practice has several other sub-committees which are devoting much time to various other phases of the problems which come under the general scope and purpose of the central committee. One of these sub-committees is working on the question of model ordinances. There is considerable need for such a study as indicated by numerous requests received from all parts of the country. An additional committee will study the question of standardization of health department reports, suggesting a practice which it is hoped will harmonize and be in keeping with the various appraisal forms. Another committee will receive criticisms and comments pertaining to the *Appraisal Form* now being used for city health work. It will be recalled that this form is to receive no official revision until 1929, but it is believed that the sub-committee which has been appointed can receive and digest suggestions from various sources during the year 1927 and incorporate such criticisms into a tentative form of revision which can be used by the committee in its work during the year 1928. This will all be done in a way of preparation for the official revision of 1929.

Pictorial Appraisal of City Milk Supplies—From the Department of Public Health of Rockford, Illinois, comes a unique graphic method of scoring the milk control program of a city. Dr. N. O. Gunderson, Health Officer, and his inspectors, have devised 40 searching questions bearing upon important items in a milk control program. The whole scheme is presented in simple language so that almost any group of persons can determine the scope and adequacy of their city's milk control program. Copies of the Appraisal Plan can be obtained from Dr. Gunderson. It should be a very valuable aid in interesting a community in its milk situation.

LABORATORY

C. C. YOUNG

THE DETERMINATION OF CAUSTIC CONCENTRATIONS OF DETERGENT SOLUTIONS IN BOTTLE WASHING

MILTON E. PARKER, S.B.
Walker-Gordon Laboratory Company, Plainsboro, N. J.

RECENT INVESTIGATION[1] has revealed the necessity for an accurate control of the caustic concentrations of detergent solutions used in bottle washing by automatic bottle cleaners. The active germicidal and cleansing properties of these soaking solutions are determined in a considerable measure by their caustic strengths, that is, the percentage concentration of caustic soda (sodium hydroxide).

The use of hydrometers or titration with phenolphthalein are not reliable inasmuch as neither method makes it possible to determine the actual percentage of caustic soda as has been shown in recent experiments[2]. Therefore, many technicians resort to the method of R. B. Warder for the determination of alkali carbonate and hydrate in the presence of one another[3]:

> To the cold solution containing phenolphthalein, hydrochloric acid is added and the liquid is gently stirred with a glass rod. Decolorization takes place when all of the hydroxide and half of the carbonate are neutralized:
>
> (I) $NaOH+HCL \rightarrow NaCl+H_2O$
>
> (II) $Na_2CO_3+HCl \rightarrow NaCl+NaHCO_3$
>
> To the colorless solution, methyl orange is added, and the solution is again titrated with acid until the other half of the carbonate is neutralized, when the solution turns brownish-red.

While this method provides an accurate qualitative and quantitative determination of caustic soda in the presence of soda ash (sodium carbonate), its past utility has been confined to the technician. Obviously, the operator of an automatic bottle cleaner does not ordinarily possess the technical training necessary to compute the percentage concentrations of his detergent solutions. Inasmuch as investigation has revealed the present methods of hydrometry and titration with phenolphthalein to be inadequate qualitatively as well as quantitatively, it is little wonder that health officers sometimes report the soaking compartments of automatic bottle cleaners in operation to contain as low a percentage concentration of caustic soda as one-tenth of one per cent (0.1 per cent).

With these facts in mind, an automatic caustic testing apparatus has been designed that permits the ready and accurate determination of caustic soda and soda ash by an inexperienced operator. This apparatus has as a special feature, a double scale burette calibrated to give directly the percentages of the two alkalies in detergent solutions.

In operation, the double scale burette is filled to zero with the standard hydrochloric acid solution. A few drops of phenolphthalein are added to the previously measured sample and titration with the acid solution proceeds until decolorization takes place, when all of the caustic soda and half of the soda ash are neutralized, as indicated above in equations (I) and (II). The point on the right hand (T) scale of the burette registered as the result of this titration is noted. The burette is then refilled to the zero mark and methyl orange is added to the colorless solution. The sample is again titrated with the acid until the end-point is reached, when the other half of the soda ash is neutralized as indicated in equation (III) below:

(III) $NaHCO_3+HCl \rightarrow NaCl+H_2CO_3$

The recognition of the end-point is facilitated by color standards contained in the stirring rod provided. The point on the left hand (t) scale reached as the result of this second titration registers the percentage of sodium carbonate (soda ash) contained in the sample. The point of the right hand (T) scale registered as the result of the second titration is subtracted from the reading obtained in the first titration to give the percentage of caustic soda (sodium hydroxide) in the sample.

This testing apparatus also makes it possible to determine the caustic concentrations of washing compounds and by resorting to a simple

factor, the analysis of washing powders and detergent solutions containing the bicarbonate (baking soda) as well as the carbonate and hydrate of soda is made possible. This automatic caustic testing apparatus has been constructed and assembled by Louis F. Nafis, Inc., of Chicago, Illinois.

REFERENCES

1. The Practical Sterilization of Milk Bottles by Chemical Disinfection. *The Milk Dealer*, 16:1 (Oct.), 1926.

2. The Maintenance of Detergent Solutions Used in Bottle Washing. *The Glass Container*, 5:11 (Sept.), 1926.

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VITAL STATISTICS

LOUIS I. DUBLIN, PH.D.

Japanese Population—By the completion in 1925 of the second regular census in Japan, an accurate check has been made for the first time on the growth of the population. In Japan proper, exclusive of Korea and Formosa, the increase in population between the years 1920 and 1925 has been about 750,000 a year—this figure is without taking into account the 250,000 people killed in the great earthquake of 1923. In Japan proper, the natural increase of births over deaths was 875,385 in 1925. During this period, 2,086,091 people died, the births exceeding deaths in a ratio 172 to 100. During 1925 there were 1,042,976 persons married, which is an increase of 8,308 over 1924, while there were 83 fewer divorces registered—the 1925 figure was 51,687. There were 1,060,827 male children and 1,025,264 female children born during 1925 while of the total deaths 621,357 were males and 589,347 females, giving males in Japan a net gain of 3,555 in number. According to official figures all the Japanese abroad in all countries of the world on June 30, 1924, totaled 594,681—a figure equal to about eight months' natural increase in the home population.—*Denver Post*, Oct. 12, 1925.

Public Health in Fiji—The total population according to the 1921 census, was 157,266 (84,475 native Fijians, 60,634 Indians, 3,878 Europeans, some Polynesians and others). The health of the colony during 1924 was satisfactory. There were a few cases of dysentery and aside from a localized epidemic at Nadi, very little typhoid fever. Mild cases of influenza were prevalent during the latter part of the year. Infant mortality which is low among other races in the colony is too high among Fijians. Nine-tenths of the population received treatment against ankylostomiasis. After the second treatment, 73 per cent were cured. Over 5,000 Fijians received treatment for yaws. Fourteen lepers were discharged from Makogai asylum, in each case all signs of active disease being absent for over 2 years. Births during the year were: Europeans, 136; Fijians, 3,015; Indians, 2,280; and others, 139. The deaths were: Europeans, 42; Fijians, 1,989; Indians, 325; and others, 42. In 1924, 1,400 native children were inoculated against smallpox.—*Lancet*, 2:530 (Sept. 4), 1926.

Public Health in Bengal—Severe criticism has been expressed as to the manner in which vital statistics are being kept in Bengal. Some improvement has occurred in this respect in rural areas but in towns, where registration of births and deaths is compulsory, great laxity still exists.

Although the cholera mortality in Bengal in 1924 showed a slight increase over that in 1923, the decline in the curve noticeable during the last few years continued. During the first 6 months of 1925 there was a recrudescence of smallpox in epidemic intensity. The mortality while high was not as severe as in the previous epidemic of 1919 to 1920. The number of deaths in various places appeared to bear definite relation to the density of the population. The general decline in malaria observed since 1921 continued; it was more prevalent with a higher death rate in rural areas. The mortality attributed to kala-azar increased during the year, the rate being augmented perhaps by better registration or more careful diagnosis; enteric fever was less prevalent. Deaths from rabies, pneumonia and pulmonary tuberculosis were rather more numerous than in 1923 while the incidence and death rate of influenza diminished.—*Brit. M. J.*, 2:359 (Aug. 21), 1926.

Value of Iodine in the Treatment of Scarlet Fever—It seems rather unusual to advocate iodine, an element with irritant properties, as a new remedy in scarlet fever, a disease whose toxin possesses more or less of a destructive action upon the kidneys, skin and other tissues. However, clinical study, experience in private practice as well as corroborative evidence in the following hospital report, have proved that iodine, or the particular modification that was used, is of unusual value in the treatment of scarlet fever.

On July 25, 1925, a control test was started at the Philadelphia Hospital for Contagious Diseases, the results of which were completed November 28, 1925. The 200 cases were all definitely diagnosed and the more severe types were selected for colodine treatment. Standard doses were adopted without consideration of age and only slight modifications were made at different stages of the disease. The aim was to get rapid saturation with the drug and then to taper off gradually as the acute symptoms subsided.

The unusually small number of complications and their mild character together with the total absence of house infections in the cases treated with full colodine medication fairly early can be explained only by the fact that the drug increases the resistance and stimulates the fighting powers of the body against infection. No toxic phenomena nor special effect on the heart were evident during or following the administration of the drug. Contrary to general expectation, cases showing signs of kidney irritation before the drug was given, cleared up rapidly and completely under iodine. In fact not one but all factors are favorably influenced to a degree not as yet attained by any other form of treatment.

In both the control and iodine-treated series, no complication occurred in any of the mild cases. Excluding complications that existed before medication was started and those that occurred after it was stopped, the actual decrease was from 180.7 per cent to 9 or 9.3 per cent. With intensive medication started earlier as is possible in private practice and continued longer after the acute symptoms have subsided and the average complication period passed, the 9.3 per cent complications would be greatly lowered, a result not as yet shown by any other form of treatment.

Colodine is deserving of a high place in the specific treatment of scarlet fever and may or may not be combined with the serum in severe cases.—Novak, Harry J., *Med. J. & Rec.*, 124: 267–270 (Sept. 1), 1926.

Malaria in the Treatment of General Paralysis—General paralysis has proved a most refractory problem for, by the use of all specific preparations available and the various methods by which they have been applied, rarely has it been possible to do more than delay for a brief time the inevitable fatal termination of the disease. The advent of malaria inoculation in this field of therapy offers new possibilities. The following are the results of various studies made in the treatment of paretics by inoculating them with benign tertian malarial plasmodium and supplementing this with arsenical and mercurial injections.

Reviewing a group of 300 untreated cases, complete remissions occurred in 4.8 per cent and incomplete in 14.9 per cent, making a total of 19.7 per cent, in which some form of remission occurred.

In 1917, at the Wagner-Jauregg Clinic, 9 patients were artificially infected with tertian malaria. The malaria was terminated and patients then treated with neosalvarsan. After 2 years, 6 of these 9 patients were reported as free from symptoms. After 6 years, these patients were again reported as well and working. The other 3 cases were only slightly improved.

At the Brooklyn State Hospital in 1924, there were 110 patients inoculated; 20 did not take, leaving 90 cases treated. The results were good remissions, 33 or 36.7 per cent; slight remissions, 12 or 13.3 per cent; unimproved, 19 or 21.1 per cent; died during or after treatment, 26 or 28.9 per cent. Deaths in the 20 cases that were inoculated and did not take numbered 14.

According to observations made, it would seem to indicate that artificial or inoculation malaria has a definite value in the treatment of general paralysis. Following this form of treatment remissions frequently occur in cases previously treated by older methods without success.

Malaria followed by intensive, specific, drug treatment gives better results than malaria alone. Tryparsamide seems to enhance favorable results more than other drugs. While improvement in serology does not always parallel the clinical improvement, there is a tendency for it to do so in cases receiving the combined treatment. The serology may change in both directions from time to time. Improve-

ment in serology may occur late, 2 to 6 months after treatment.

The death rate in untreated cases is higher than in the treated group. Many cases reported are well on their second year after treatment and, to date, no deaths have occurred in the good remission groups.

The passage of the plasmodium through many humans does not affect its potency. Granting that the passage of a malarial strain through many human hosts renders it asexual and non-transmissible by the anopheles as shown by the experiment reported from the Vienna clinic, it would seem advisable to use such a strain when obtainable.

If cases are carefully watched during the course of treatment it is rare than any untoward symptoms occur that cannot be satisfactorily managed. Experience has shown that there are few paretics in which this form of treatment is counterindicated.—David Corcoran, *State Hosp. Quart.*, 11:587-602 (Aug.), 1926.

Neonatal Mortality—The idea of prenatal care has gradually won its way since 1900. In 1920 and 1921 favorable reports began to appear in various standard medical journals as to the value of early anti-syphilitic treatment of the expectant mother. In London, Baltimore, Paris and elsewhere, in special wards and clinics, many expectant mothers with positive Wassermann reactions, placed under proper treatment, instead of delivering a dead or diseased child, have borne a child alive and well. In the Edinburgh Royal Maternity Hospital, according to a report in 1922, the total number of mothers suffering from venereal disease was 171, the total number of stillbirths was 27 or 157.8 per 1,000. The rate of stillbirths per 1,000 for mothers who received antenatal obstetrical care and anti-syphilitic treatment was 50.7. Among those not receiving such treatment, the rate was 606 per 1,000.

Dr. Eardley Holland in the *Causation of Foetal Deaths*, published in 1922, investigated 300 cases during the 7 years 1914 to 1921. It was found that 167 of the deaths occurred at or near time of birth. Complications of labor caused 51 per cent of the mortality. Syphilis caused but 16 per cent, which was quite contrary to the general opinion of 50 per cent. Dr. Gordon Gallie of Toronto and others have arrived at a similar conclusion in their work.

It is generally agreed that stillbirths (after the 28th week) are 30 per 1,000 births and that miscarriages are 4 times as many. That is, 1,150 pregnancies for 1,000 living births. In 1900, when infant mortality, even in England, was 153, the conclusion was right that prenatal loss was equal to infant mortality. Half of this mortality occurred in the first month of life. It has not been reduced in the years that followed.

In every 1,000 births in Canada in 1924, five mothers' lives were lost. In New Zealand and the U. S. Registration Area, similar conditions exist. Better care of the mother, antenatally, intranatally and postnatally will cause neonatal mortality to fall until it reaches the irreducible minimum. This reduction will follow with the enlightenment of the public, above all the mother herself and the education of the profession which in its aim for better obstetrics should provide wards for premature babies wherein they may be cared for sedulously and scientifically.—Helen MacMurchy, *Pub. Health J.*, 17:442-447 (Sept.), 1926.

The Vaccination Scar as an Index of Immunity—The value of vaccinia as a prophylaxis against smallpox has been scientifically proved. The fact that vaccination protects against itself has been recognized for practically as long a time owing to the inability of a person recently vaccinated to get a typical "take" on subsequent vaccination. This presumed nonsusceptibility is in reality the prompt reaction of an immunized individual.

It is hard to say what relationship exists between immunity to variola and immunity to vaccinia. Perhaps the person who is highly immune to smallpox is at the same time highly immune to vaccinia while decreasing immunity to smallpox is accompanied by a parallel decreased immunity to vaccinia. The converse is also probably true and for practical purposes it is sufficient to create immunity to vaccinia in order to protect against smallpox.

In the minds of many physicians there exists another indication of immunity against smallpox. This is the scar of previous vaccination. Undoubtedly, the impression is prevalent that immunity is indicated by the size, number and character of the scars of previous vaccinations. Virulent strains of smallpox demand a higher protection than that indicated by the mere evidence of one former vaccination. The statistics, most quoted, show a higher mortality in the London Smallpox Hospital, 1836-1855, among those with poor, ill-defined scars of vaccination, than among those with good marked scars and among those with few scars than among

those with many. But in each of these classifications, it is probably the latter group that is likely to have been the most recently vaccinated.

In an attempt to find out how much reliance could be placed on "good scars" as indications of immunity against vaccinia and therefore against smallpox, record was kept of 874 cicatrices of previous vaccinations on the men undergoing vaccinations on entrance to Lehigh University in the fall of 1924. As each man came to be vaccinated, the following notations regarding his previous vaccination scars were made: (1) location, (2) size in millimeters (length and breadth), (3) whether pitted or smooth and (4) whether faint or marked. Among the men presenting "good scars" of previous vaccinations, a slightly higher percentage of vaccinias was obtained; presumably indicating a higher percentage of complete absence of protection against smallpox than among those who showed "fair scars." The size of the scar of previous vaccination, the character of the scar, and the amount of scarring have no practical bearing on a person's immunity against vaccinia or variola.—J. P. Leake and Stanley Thomas, *Jour. A. M. A.*, 87:1125–1126 (Oct. 2), 1926.

The **Occurrence of Benign Glycosuria in Diabetic Families**—Investigations into heredity in diabetes are in certain respects attended by favorable circumstances since the disease is common in almost every country causing no lack of material for further investigation. Yet, a large number of cases of this disease is latent. In examination for life insurance on a number of males over the age of 10, this disease was discovered by chance in 11 per cent. Among 48 cases of diabetes fortuitously discovered no diabetic symptoms of any kind were present in 77 per cent. Cases of this nature easily escape detection, and if it is a question of persons belonging to an earlier generation, the acquisition of information about them is entirely prevented.

Frequently one thing known about one or more members of the family investigated is the bare fact that glycosuria is present. In 11 families under study both diabetes mellitus and nondiabetic glycosuria occurred. The glycosuria occurring in diabetic families was of no definite type but comprised cases due to alimentary hyperglycemia as well as the renal form. The association of diabetes and nondiabetic glycosuria was observed so frequently that it would not be fortuitous but must have depended on an hereditary biologic relationship.

The restricted extent of the material did not permit definite conclusions to be drawn concerning the nature of this relationship, but it seemed hardly likely to be due entirely to a quantitative difference.—J. E. Holst, *Arch. Int. Med.*, 38:279–291 (Sept.), 1926.

Basutoland Statistics for 1925—This native territory in South Africa has an area of 11,716 square miles; the altitude varies from 5,000 feet to 11,000 feet above sea level and the climate is, on the whole, healthy. The population in 1921 was 495,937 natives, 1,603 whites, 1,069 colored, and 172 Asiatics. In 1925, 59,295 patients were treated at the Government dispensaries, in addition to 2,221 in-patients in the hospitals of Maseru, Leribe, Mafeteng, Mahalis Hock and Quthing. In 1925, there were 2,148 operations performed.

The general health of the territory was good. Typhus fever, which has been endemic since 1917, has almost disappeared, only 51 cases with 4 deaths being reported in 1925, as compared with 556 cases and 41 deaths in 1924 and 958 cases and 120 deaths in 1923. Last year 26,632 persons were vaccinated against smallpox. Influenza and dysentery were responsible for 589 and 130 cases respectively, and were of a mild type. Free treatment of syphilis has been continued and the number of persons availing themselves of this privilege is increasing each year. On December 31, the number of inmates at the Leper Settlement was 461; males 228, females 233. Intensive treatment of leprosy still continues to be rigorously pushed with rather gratifying results.—*Lancet*, 2:888 (Oct. 23), 1926.

PUBLIC HEALTH ENGINEERING

ARTHUR P. MILLER, C.E.

Dumping of Garbage at Sea Resumed by Oakland—This article is a brief review of the history of garbage disposal methods of Oakland, Alameda, and Berkeley, California.

In Oakland some twenty-five years ago unsuccessful attempts extending over one year were made to dry and burn the garbage in concrete ovens. Tide lands were next used as dumping grounds until last July, except during two or three years when dumping at sea was practiced until the garbage steamer was wrecked. Sea dumping was resumed when the city entered into a five-year contract in July, 1925.

Garbage and trash amounting to 250 tons daily are collected by the city, hauled to the wharf and dumped into skips, which in turn are emptied into one of two steamers. The steamers have a displacement of 2,000 tons; and are provided with 14 side dump compartments all above the water line. The refuse is dumped some 30 miles beyond the Golden Gate, after which the compartments are cleaned with steam and salt water. The contract price for disposal is 87 cents per ton. A considerable amount of refuse is burned on the tide flats near the garbage wharf, thus reducing the quantity of light floating matter.

Alameda dumps its garbage and trash directly from scavenger wagons into marsh lands at the west end of the city. To prevent nuisance the six-foot dump is sprayed with fly poison, covered bi-weekly with six inches of earth, and a rat trapping and poisoning campaign is conducted. Sanitary fill maintenance averages $100 per month.

Berkeley, prior to 1915, dumped its garbage at sea. In 1914, an English high temperature type incinerator was constructed, consisting of three furnaces, a combustion chamber boiler, blowers and 150 feet of stack, which was used with some interruption until 1924. Since that time the sanitary fill method of disposal on marshy ground has been practiced. Collections amount to 50 tons of garbage daily and 27 tons of street sweepings.—*Eng. News-Rec.*, 96:194 (Feb. 4), 1926. Abstracted by J. K. Hoskins.

Lime. Its Use in the Treatment of Industrial Wastes—Trade wastes usually carry large quantities of solids in suspension, in colloidal form or in solution which may bring about objectionable conditions in the receiving body of waters. Lime treatment of these wastes is dependent upon the conditions peculiar to each individual waste.

Lime is most commonly used in waste treatment as a precipitant; for the neutralization of excessive acidity; as a means to control the hydrogen-ion concentration for assisting precipitation by other chemicals; and in the case of putrescible wastes, as a deodorant.—S. E. Coburn and E. S. Chase, *Rock Products*, 42 (Oct. 31), 1925.

Sewage Irrigation—This is a general article reviewing the method and some of the advantages and disadvantages of sewage disposal by broad irrigation. Various means of applying the sewage to the soil are described, such as the ridge and furrow system, the pipe and hydrant system, the bud and ridge system and the catch work system.—*Rep. of the Consul*, Kingston, Can., Feb. 8, 1926. Abstracted by J. K. Hoskins.

Investigation of Pollution of Flambeau River at Park Falls, Wisconsin—This excellent publication summarizes the evidence presented before the Railroad Commission of Wisconsin in regard to stream pollution by wood pulp and paper mill wastes, and its effect on fish life together with specific evidence in the case and the decision of the Commission.

After citing the laws and court decisions governing the subject of stream pollution, the general or basic evidence presented at the hearings is reviewed and then summarized as follows:

1. The discharge of industrial waste into certain streams is the only practical method of ultimate disposal in many cases, and constitutes a necessary and proper use of the stream, but only provided that the dilution is so great as not to be materially objectionable as a

menace to public health or interference with the natural aquatic life of the stream.

2. Factors affecting fish life may be summarized as follows: (a) Reduction of the dissolved oxygen in the water of a stream to less than 2 parts per m. for any material length of time results in death or migration of practically all fish.

(b) Some wastes, such as gas-plant wastes, mine drainage, and certain chemical wastes are toxic or poisonous to fish.

(c) Plant growth is necessary for fish life, and fish may seek other habitat due to change in the plant or aquatic life of the stream.

(d) Pollution is more deleterious to young fish, particularly just after absorption of the food sac, than to adult fish.

(e) The discharge of large quantities of suspended matter forms sludge beds in the stream and interferes with spawning and the spawn. It is also possible that certain fiber wastes accumulate in the gills of fish and cause deleterious effects.

3. Nearly all wastes, either through chemical or biological reaction, cause reduction of the dissolved oxygen of the stream, industrial wastes generally having a greater oxygen demand than domestic sewage.

4. During warm weather biological oxidation is more rapid than in cold, so that the oxygen demand of the waste is greater although the actual amount of oxygen available is less because warm water retains less oxygen in solution. Furthermore, the tolerance of fish is less in warm than in cold water and their oxygen requirements are greater.

5. When the dissolved oxygen of a stream is depleted green plants and other classes of aerobic life die and anaerobic organisms, such as worms and lower animal life, prevail.

6. A stream tends to purify itself by natural processes and will ultimately return practically to normal if the concentration of the wastes is not too great and sufficient time elapses before there is additional pollution.

7. While some streams in Wisconsin are badly polluted it is reasonably practicable to control this pollution so as not to affect materially the aquatic life of the stream.

The paper industry in Wisconsin is next discussed, the pulping process described and the nature and extent of wastes resulting from the various processes as well as methods of recovery of by-products is considered. The specific evidence relating to the Park Falls case is then reviewed in detail, including the analytical data. The findings are next presented. The Commission, recognizing that no practical method of treatment of sulphite waste exists, recommends that the paper industry organize its various units and maintain "a sustained, systematic and scientific search for the solution of the problem of the disposal of the waste materials from the pulp and paper mills in cooperation with such state and federal agencies as may be available." Jurisdiction is reserved to enter an affirmative order for the period of one year.

A bibliography of papers and publications offered in evidence is appended, together with a list of 39 papers having a direct bearing on the problems involved. (W.P.—234.) Decided February 20, 1926. 64 pages. Published by the Commission. Abstracted by J. K. Hoskins.

Foaming in Coagulating Basins and Air Bound Filters—Experiences with foaming in coagulating basins and the air binding of filters, and opinions as to the cause as expressed by certain members of the North Carolina Section, are given.—*J. Am. W. W. Assn.*, 15:42 (Jan.), 1926. Abstracted by A. L. Dopmeyer.

Sterilization of Water Mains After Laying—This is a brief article in which the author suggests a method for applying liquid chlorine to water mains after laying.—C. W. Absher, *J. Am. W. W. Assn.*, 15:52 (Jan.), 1926. Abstracted by A. L. Dopmeyer.

The Chloromine Treatment of Pure Waters—Experiments to determine the effect of ammonia and its salts in conjunction with chlorine, as a means of sterilizing relatively pure waters, are described in this article.

Data are given of the effect on taste and on bacterial content of adding ammonia, ammonium chloride and sulphate to phenolated water prior to and at the time of chlorination. The results as applied to chemically pure water are summarized by the author as follows:

1. Ammonia, when mixed with chlorine in certain proportions and added to a water containing phenol, is an effective taste preventive.

2. Ammonium chloride or ammonium sulphate with chlorine is not so effective.

3. The addition of ammonia or the above salts to the water prior to chlorination is not an effective taste preventive.

4. Certain proportions of chlorine and ammonia may give rise to chlorinous or similar tastes.

5. Ammonia when mixed with chlorine produces a retarding effect in the sterilization but
6. There is evidence of more efficient sterilization ultimately.—B. A. Adams, *Med. Off.*, 35:55 (Feb. 6), 1926. Abstracted by J. K. Hoskins.

Sanitary Rules and Regulations No. 81. Pollution and Contamination of Public Water Supplies; Promulgated—The sanitary rules in regard to the pollution of public water supplies contain 15 sections, treating upon the dumping or discharging of refuse, sewage, etc., into streams, artificial channels, water sheds, etc., without treatment first. It gives the Commissioner of Health and municipal health officers power to enter premises located on watersheds, etc., to enforce the provisions of the regulations and bring to law any offenders.—H. M. Towner, *Porto Rico Health Rev.*, 1:38 (Nov.), 1925. Abstracted by J. H. O'Neill.

Municipal Water Treatment Plant, Newark, Ohio—This plant treats water from Licking River, a flashy stream. Treatment includes softening and a unique baffling scheme. A Dorr clarifier between mixing tanks and settling basins and carbonation of treated water solve problems of treatment.—C. T. Kaiser, *Am. City*, 33:599 (Dec.), 1925. Abstracted by J. H. O'Neill.

Some Facts in Good Industrial Lighting—In this paper the author discusses the relation of lighting to industrial practice under the headings of safety, production and hygiene. It is pointed out that lighting, in order to be considered good, must be sufficient in amount and suitable in nature.

Adequacy of illumination, in the author's opinion, is based on the standard formulated and discussed by the Factory Lighting Committee in their third report as follows:

(a) Very fine work—Minimum 5 foot candles
(b) Fine processes —Minimum 3 foot candles
(c) Other processes—Minimum .25 foot candle

Under the caption of adequacy, the author emphasizes the importance of the maintenance of the illumination system, pointing out the well known fact that poor maintenance may greatly reduce the illumination intensity on the working plane.

The suitability of illumination is discussed chiefly from two viewpoints, glare and shadows. Three forms of glare are described, (1) due to looking directly at a source of light, (2) refracted glare due to refraction from a polished surface, (3) glare due to the presence of a light source in the visual field without necessity of being directly viewed by the worker. The remedy for glare, it is pointed out, lies in the introduction of a protective measure between the eye and light source, and, secondly, the alteration of the position of the source. The value and treatment of shadows is considered by the author to be of much importance and in this connection he points out that direct-indirect lighting is of great value.

Natural illumination is briefly treated in this paper, the writer emphasizing, (1) the importance of clean windows, (2) the removal of obstruction from windows, and (3) the cleanliness and proper choice of ceiling and wall colors so as to aid in reflecting the light.—D. R. Wilson, *J. Roy. San. Inst.*, DESBCC (Nov.), 1924. Abstracted by Leonard Greenburg.

East Ham Municipal Engineering Works—Refuse is disposed of by destroying in a destructor, the energy generated being used for pumping sewage. Sufficient heat is derived from refuse alone during the winter months but the addition of pan breeze is required in summer. The excess house refuse which cannot be burned in the destructor is pulverized and used for covering old refuse dumps and sludge lagoons.—*Surveyor*, 68:301 (Oct. 9), 1925. Abstracted by R. E. Thompson.

How Nature Destroys Microbes in Water—Pollution of the soil, the air and the waters is almost continuous, but spontaneous cumbustion takes place, without which life would become impossible in a medium infected by the microbes of putrefaction and of a wide range of diseases. Bacteriologists following Pasteur, Chaveau and others, have given to this phenomena of the destruction of bacteria, that is, the dissolution of the microbes, the term "bacteriolyse" or "bacteriolicid."

The natural destruction of microbes has been attributed to the light of the sun, and more particularly to the ultra-violet rays and its calorific rays. Desiccation by the oxygen in the air, and mechanical action have also been considered factors in the destruction of microbes. Apart from the physical agents of destruction, microbes are found that may attack other microbes and destroy them.

In 1917 d'Herelle filtered the discharges from a dysentery patient in convalescence through a Chamberland porcelain filter and demonstrated

that the addition of a few drops of this filtered solution prevented the development of dysentery bacillus in a cup of culture. This destruction of the culture is what is commonly termed "the d'Herelle phenomena." The virus of d'Herelle is so small that it will traverse the porosity of the closest porcelain filter, and the failure of a culture to develop or the destruction of the visible microbes is the only visible evidence we have of its development. Since the virus produces the destruction of the microbe which it devours, it is now commonly designated as the "bacteriophage."

In the cure of certain diseases such as dysentery, paratyphoid, typhoid fever and the like, the bacteriophage plays an important part in destroying the bacteria which produce these diseases.

A number of experiments were performed relative to the destruction of dangerous microbes in water by the bacteriophage principle. In these experiments several samples of the water were filtered through porcelain filters L3, and then a few drops of this water were added to the microbic cultures. As soon as the filtered solution became empowered with the bactericidal power the cultures would not develop. It was found that all waters do not possess an equal bactericidal power, and certain waters are without any particular power of this kind. Still other waters exercise a very marked destructive action with regard to some special microbe.

The different waters which were examined and their bactericidal power is noted.—Fernand Arlong, *Fire & Water Eng.*, 78:1283 (Dec. 9), 1925. Abstracted by F. J. Moss.

Treated Water in Swimming Pools—When it becomes known that a swimming pool water is being dosed, complaints of smarting of the eyes, nose, etc., may be received. Such complaints are usually unfounded unless the pool is being overdosed. In certain instances claims were made that suits and towels were rotted by the pool water. Such complaints can usually be traced to excess use of "high power" washing compounds and incomplete rinsing in the laundry. All complaints against pool water should be immediately followed up and the blame placed where it belongs to prevent the pool getting a bad name.—F. H. Stover, *J. Am. W. W. Assn.*, 14:440 (Nov., 1925). Abstracted by S. DeM. Gage.

INDUSTRIAL HYGIENE

DR. EMERY R. HAYHURST *

Ohio **Industrial Commission Decisions**—Irritation of throat and nose by cast-iron dust is not a compensable disability on the basis that no specific injury is shown.

A bookkeeper whose hands and arms are affectionately licked by a dog procured by her employer as an aid to her protection when alone in the office, is entitled to reimbursement for expense of Pasteur treatment given as a preventive of rabies, when it was found the dog was afflicted with such disease at the time she fondled him. The claimant suffered no ill effects from her contact with the dog and medical services rendered were purely a preventive measure to forestall serious or fatal infection. The basis of the Commission's finding was that the watch dog, which made necessary the medical treatment set forth in the claim, was furnished by the employing company for the benefit of said company in the conduct of its business.

A workman, while standing in an ice-filled fan hole at a brick kiln, making doors to close openings, suffers a frozen left foot—amputation of the foot being necessary—and sustains an injury in the course of and arising out of employment.—*Ind. Rel.*, 3:10, Ohio Indust. Comm., Oct., 1926.

Rare Forms of Industrial Poisonings—*Trichlorethylene*—Cleaning a typewriter; electroplating; violent narcotic effects on a girl cleaning a Batik pattern; cleaning wire gauze; removing grease from metal parts; cleaning glass lenses; dipping sheet metal in same; scouring wool with same (often attacked by fainting fits, also suffer from somnolence).

* The editor of this Section will gladly receive contributions from members. Please address all communications to State Department of Health, Columbus, O.

Amyl Acetate—Furniture factory workers (headache, sick feeling, vomiting, cough). *Tetraline* causes irritation of the eyes, and of the upper respiratory passages and a greenish tinge in the urine. *Zapon lacquer* (symptoms probably due to *amyl acetate*), causes congestion of face, a feeling of pressure in the head, and attacks of giddiness.

Acetone—Bicycle handle manufacturing, complaints of unwholesome effects.

Calcium Cyanamide—Manufacture of same (respiratory troubles, fainting).

Turpentine substitutes—Serious eczema (Berlin, Weisbaden).—*Internat. Labour Rev.*, 14:3, 377-407, Sept., 1926.

Trapping Dust Produced by Pneumatic Rock Drills—In the preface, J. S. Haldane observes that all ordinary kinds of dust are easily eliminated from the lungs, partly by the action of cilia, and partly by the action of phagocytic cells which collect the particles and carry them to the point where they are swept upward by ciliary action. In coal miners, elimination keeps pace with deposition, so that no harm results. Hence, coal miners are exceptionally free from phthisis, and in Great Britain this low death rate counterbalances their higher death rate from accidents. Nevertheless, a minimum of dustiness in all mining operations is very desirable. With dangerous dusts there is a failure in the process of elimination. As a consequence infection by the tubercle bacillus becomes very easy. Sandstone dusts are particularly among the dangerous ones. The apparatus constructed by Professor Hay, according to tests, has been very successful in removing dust from drills used in coal mining.

Finding that water spray methods in connection with rock drilling do not remove the dust hazard, the author undertook to construct an apparatus on a suction principle, used without water, which would remove the dust at its source. At the same time he realized that the apparatus must be simple in design, light in weight, easy to manipulate, must not hamper the operator or reduce speed, must effectually remove the dust, and must be reasonably inexpensive. The apparatus was suggested by a device evolved by E. L. Collis and Sir Henry Cunynghame in 1912 utilizing a suction draft attached to an ejector tube and a collecting filter bag open at both ends. The work was done experimentally first at the Royal School of Mines, South Kensington, later in a colliery. The third model developed appeared to prove efficacious, in that it kept the number of dust particles per c.c. down to the neighborhood of 300 or less with 2 different types of pneumatic drills, under actual working conditions, in 2 stone drifts, the men finding the apparatus simple, and experiencing no difficulty in handling. The manager of the colliery stated, "In my opinion, quite apart from the question of health, such an appliance will greatly improve the working conditions in stone drifts, and increase the comfort of the men employed therein, and in addition I feel confident will prove to be a great step in the elimination of miners' phthisis."—P. S. Hay, Safety in Mines Research Board (Great Britain), Mines Department, *Paper No. 23*, 18 p., illus., 1926.

Court Decisions—A case of musculospiral paralysis from exposure to cold was presented to the Kansas courts. The complainant, employed in a packing company, carried casings stuffed with frozen meats from one part of the plant to another. She claimed that her arm became so cold that it was numb, and that buckets of warm water were provided into which she would put it after removing the sausage. After 30 days' work she had pains in her arm. Her physician first noticed "wrist drop" (pp. 152-153).

An award for tuberculosis of the lungs consequent upon breathing granite dust in the person of a tool sharpener was granted by the Wisconsin Industrial Commission and assessed against 3 employers. The circuit court and the supreme court held that the accident was within the constitutional province of the legislature and the delegated powers of the commission and affirmed the judgment (pp. 162-163).

An employe of a sparkler and specialty company at Elkton, Md., contracted phosphorus poisoning, resulting in various surgical operations and serious disfigurement. She brought an action, by her father as next friend, for the amount of $22,500, under the state compensation act, but demurrer was overruled. The defendant then appealed. The lower court affirmed that the employer was liable at common law if the injury was not compensable under the terms of the compensation act, and that the disease of phosphorus poisoning was an injury outside of the purview of the act. The court of appeals, finding the question a new one, considered the subject at length. "The phosphorus poisoning of the employe as described in the declaration was therefore not a

disease incident to the industry, but was an injury in causal connection with her employment, within the meaning of the act defining injury to 'mean only accidental injuries arising out of and in the course of employment and such disease or infection as may naturally result therefrom.'" The judgment for damages was reversed, but on a motion for a modification of this judgment, in view of the newly alleged fact that the employe was under 18 years, the court remanded the case with leave for a new trial, but the case was afterwards compromised (pp. 213-216).—*U. S. Bur. of Labor Statistics*, Bull. No. 417 (pp. as above cited), Labor Decisions, 1925.

Influence of Ventilation and Heating on the Health of Factory Workers—Effects of physical conditions were studied in factories.

"It seems reasonable to suppose that for industrial workers engaged on light work the factory temperature in winter time in Great Britain should be only slightly above 60° F. It is sometimes maintained that it ought to be at about 65° and though this temperature creates a greater sensation of comfort, it seems probable that it is rather too high for maximum efficiency. It may be that a temperature of 65° is desirable for some countries, such as the United States, which usually have a colder winter temperature than we do, for in their factories the humidity of the air is lower than ours, owing to the more extensive heating required. The drier the air, the higher the dry bulb temperature necessary to create a given sensation of warmth.

"We cannot say definitely what velocity of air currents is best, but as a general rule ventilation should be kept as great as possible consistent with the avoidance of draughts.

"In winter time, with a factory temperature of 60°-64°, an average velocity of 30 ft. per minute should be maintained (in mild summer weather increased to 40 ft. and in hot weather to 50 ft. or more."—H. M. Vernon and T. Bedford, Fourth International Congress for Industrial Accidents and Diseases. Amsterdam Report, pp. 449-454 (Sept.), 1925.

FOOD AND DRUGS

WALTER S. FRISBIE

Presence of Compounds of Arsenic in Marine Crustaceans and Shell Fish—A recent discovery that certain marine algae contain heavy traces of arsenic led the author to study in a systematic manner a number of shellfish for possible arsenic content. Comment is made that relatively little attention to this subject has been given by investigators since Bertrand, in 1902, announced that the arsenic content of fish is greater than had been supposed. Oysters of British origin were found to contain arsenic as arsenious oxide in amounts from 3 to 10 p.p.m. on the wet substance. Portuguese oysters contained 33 to 70 p.p.m. on the same basis; scallops, 36 to 85 p.p.m.; and mussels, 36 to 119 p.p.m. The author here points to the possible connection of this high content to the poisoning symptoms frequently following the eating of mussels, and which have been ascribed to the presence of a poisonous alkaloid. Six samples of lobsters varying in weight from 2 to 5 lbs. were examined. Three had been boiled and arsenic determined in the flesh representing 50 per cent of the lobster as purchased ran from 36 to 40 p.p.m. Comparison was also made of the arsenic content of the boiled and the unboiled lobster meat in which there was found essentially no difference; the maximum amount of arsenic was 110 p.p.m. on the wet substance. The alleged indigestibility of lobsters with some individuals is again pointed to as possibly to be explained by the arsenic content. Figures are given for other marine animals, including prawns, shrimps and crabs, and in one sample of prawns 174 p.p.m. of arsenic were found. Samples of sea water in and about the Thames estuary showed 0.14 to 1.0 p.p.m. of arsenic. Conclusion is reached that the arsenic content of the animals examined was derived from sea water. A few experiments as to arsenic in flat fish confirmed results reported in a survey by the Swedish Commission and H. E. Cox, pro-

portions running from 3 to 10 p.p.m. on the wet substance. Conclusion is reached that the arsenic cannot be present as arsenious oxide or in any form having a similar degree of toxicity. Sample of lobster was dried, ground to powder and organic matter destroyed, and found to contain 67 p.p.m. as As_2O_3. With aqueous extracts of this powder and with hydrochloric acid and caustic soda solution only 8 p.p.m. were obtained, indicating the arsenic is not in the form readily reduced by hydrogen. Experiments were conducted on two individuals to determine the rate of elimination of arsenic ingested in lobster. The result showed the greater part of the arsenic excreted in the urine shortly after consumption of the food but the arsenical compound was not altered during digestion so that it was directly reduced by hydrogen, an obvious bearing on the physiological and toxicological aspect.—A. Chaston Chapman, *Analyst*, 51:608, 548 (Nov.), 1926.

The Examination of Fish for Formaldehyde—The reaction of herrings and other fish to the color test for formaldehyde and to the method recommended by Schryver (Report to the Local Government Board (*Food Report No. 9*) 1909), caused this work to be undertaken to determine if the reaction was actually due to added formaldehyde. It was concluded that fresh herrings and other fresh fish may react to specific test for formaldehyde if oxidation is involved, but the reaction was not necessarily due to added formaldehyde. The positive reaction in the phenyl-hydrazine test is due to oxidation of preëxisting trimethylamine yielding formaldehyde on oxidation. Fish exposed to air until putrefaction takes place does not give increased reaction for formaldehyde. It is suggested that these results may have a bearing on those of Dill and Clark (*J. Assoc. O. A. Chem.*, 1926, ix:117).—Arnold R. Tankard and D. J. T. Bagnall, *Analyst*, 51:608, 565 (Nov.), 1926.

Nutritive Value of Protein in Animal Parts—Experiments were undertaken to determine the nutritive value of protein in beef extract, ox blood, ox palates, calf lungs, hog snouts, and cracklings, as measured by the growth in albino rats. The various meat products are described and the facts recorded by previous investigators. In the experiments each product under examination constituted the only source of nitrogen in a ration which also had adequate quantities of vitamins A, B, and D and of mineral matter. Each ration was fed to six young male albino rats, approximately 40 g. weight at start. This procedure was followed except in a few instances indicated by the graphs and data accompanying the article. Total nitrogen compounds in beef extract had a very low value for growth maintenance in rats. A ration containing 18 per cent "crude protein" (nitrogen X 6.25) was inadequate for maintenance. No comparison of dried blood and hemoglobin is made since they were distasteful to rats and food consumption was low. Serum protein showed considerable lower nutritive value than muscle protein but 15 per cent of the former was inadequate for normal growth. Protein in ox palates was evidently deficient in certain amino acids since 15 per cent of this product induced very slow growth. Hog snouts and pork cracklings contained incomplete proteins since 15 per cent of protein from either source was adequate for maintenance only. The protein in calf lungs was of fair quality, 10 per cent being sufficient for moderate growth.—Ralph Hoagland and George G. Snider, *J. Agri. Res.*, 33, 9:829 (Nov. 1), 1926.

Corrosion of Tin Plate in Tin Cans—Preserved food products have a corrosive effect on the plating of tin cans evident in three ways—discoloration, perforation and etching. Discoloration results chiefly from formation of sulphides and is objectionable but not regarded as a health factor. Perforation results from electrolytic action between the tin coating and the steel plate of the can. Etching is the result of chemical action on the tin. This increases the tin content of the food but is not considered serious as the authors regard tin salts as non-poisonous and not cumulative in the system. Various suggestions are offered to counteract these difficulties such as heavier tin coatings, lacquering and enameling of cans and the use of paper linings. None of these devices alone, however, appears to eliminate completely all forms of corrosion.—C. L. Mantell and E. S. Lincoln, *Canning Age*, 847 (Oct.), 1926.

CORRECTION

In the October Food and Drugs notes under the heading "Report of Committee on Uniform Standard Milk Ordinance," in the fourth paragraph the temperature should obviously have been "F" instead of "C" and in the fifth paragraph, last line, the word should be "include" instead of "exclude."

CHILD HYGIENE

MERRILL E. CHAMPION, M.D.

The contents of this section for the current month are chosen with a view to emphasizing certain definite phases of food in its relation to health.
The articles by Dr. Rose and by Dr. Murphy are original contributions.
THE EDITOR

IRON IN HEALTH

THAT IRON is essential to provide for development and growth is shown by the fact that nature provides the body of the new born baby with a supply sufficiently large to last the first few months of life while the baby is on exclusively a milk diet. Milk as the only food, though providing iron in a form which is most efficiently used by the body, does not provide sufficient iron when used over an extended period of time. Therefore, nature provides about three times as much iron in the body at birth as is present at maturity.

The function of iron is carried on in the blood where it forms a part of the hemoglobin, the substance essential to the burning of fuel foods in the cells. Hemoglobin is instrumental in carrying the oxygen used for this burning process and is the chief constituent of the red blood cells. Iron also is an essential element of the chromatin substances which control to a certain extent the cell activity and in this connection the iron acts as the "key" with which the energy is released from food. Most of the iron in the body is present in the form of hemoglobin, *i.e.*, in an actively functioning form, and, therefore, any reserve supply of iron must be very small. Unless the daily loss of iron is compensated by a sufficiently high intake a deficiency of hemoglobin and red blood cells will result and ultimately a condition of anemia.

To prevent this it is necessary that the food should supply for the adult man about .015 gram daily. The allowance for women needs to be more liberal for the interference of menstruation, pregnancy and lactation affect the demand for iron. According to Prof. Henry C. Sherman pregnancy and lactation probably increase the iron requirement by at least .003 gram. It would appear that the requirement for growth and development would increase the iron requirement for children. The requirement for them is probably large in proportion to their size though quantitative experiments on children have not been done extensively.

It appears from the experimental work which has been done that iron in combination with protein and with the coloring matter such as is found in the green and yellow vegetables is the form which is most efficiently used by the body. Egg yolk, cereals from whole grains, lean meat, liver, dried peas and beans, fruit and green vegetables are foods in which iron occurs abundantly and should be included in the diet.

A large serving of spinach each day will supply one-third of the day's iron requirement. If the spinach is steamed less of the iron will be lost during the cooking process than by any other method of cooking. If with the spinach is used daily an egg, a serving of whole grain cereal, whole grain bread, a pint of milk, a serving of fruit, and one potato the entire iron requirement for the adult will be adequately met.

IRON IN THE DIET OF NORMAL CHILDREN

MARY SWARTZ ROSE, PH.D., FELLOW A.P.H.A.
Professor of Nutrition, Teachers College, Columbia University, New York City

NOWADAYS, when we are trying to teach young children high ideals of health and how to secure it for themselves, we show them how animals are affected by unsuitable diets. Taking a healthy young albino rat, for instance, we point out its smooth fur, bright eyes, and

pink ears as signs of health. After a few weeks on a poor diet its fur becomes rough and its ears may lose their color. The children can see the change very easily. From this it is not difficult to pass to the signs of health in children—glossy hair, bright eyes, but instead of pink ears, pink gums and finger nails and rosy cheeks.

The high color we associate with a high percentage of hemoglobin and a high number of red corpuscles in the blood. We know that without an adequate supply of red corpuscles with a high hemoglobin content the best health is impossible.

DIETARY EXPERIMENT IN NURSERY SCHOOL

Just how this ideal supply of hemoglobin is to be obtained is not quite so clear. Iron there must be, and from Sherman's studies of iron metabolism in adults, we know that at least half a mg. of iron should accompany every 100 calories of food. We know, too, that the complex compounds of iron and protein found in food are more effectively used by the body in building hemoglobin than simpler iron salts, and lately an explanation has been offered for the greater efficiency of food iron by Hart and Steenbock of the University of Wisconsin, who find that iron-free chlorophyll added to a diet of whole milk plus inorganic iron, is a distinct aid in hemoglobin formation, indicating that besides iron the food must supply certain other organic radicals for building this complex constituent of the blood. From this new point of view foods must be studied not merely as regards total iron, but also as regards other factors in the food influencing hemoglobin formation. The Institute of Child Welfare Research of Teachers College has supplied the funds for a long and detailed study of the nutrition of a group of young children which furnishes some new data on the relation of diet to iron in the blood.* These children were kept under constant observation for periods of from 24 to 32 months. They were attendants at a day nursery, where the food could be accurately controlled and where the children received as a rule more than half of their total calories. Contact with their homes was also maintained and the home diet studied as well as the nursery diet. Thanks to this supervision, the diet of the children although necessarily limited in cost was on the whole good. A careful investigation of the food consumption showed that the children were receiving almost without exception more iron than their estimated requirement.

The children were divided into 2 groups, as nearly matched as to age and other conditions as possible, and to each child of 1 group (about 20 children) an egg was added daily to the diet, the other group of the same size having the same sort of diet without the egg. At the end of 2 years, the group having the egg showed no significant difference in height and weight gains, but did show a better general physical condition according to the records of Dr. Jean Lee Pattison who made regular monthly examinations throughout the whole time, and also an improvement in regard to both hemoglobin and red cell count. The increase was gradual but the higher level established tended to be maintained. The marked depressions of hemoglobin brought about by colds and other children's diseases affected both groups in much the same degree, but the egg group has less total days of duration of colds than the no-egg group. Cod liver oil which was administered to a few of the children, seemed to exert no influence, which is in harmony with Hart and Steenbock's observation that a liberal supply of vitamin A or treatment with ultra-violet light (a substitute for the vitamin D of the cod liver oil) did not prevent the development of anemia as did chlorophyll.

VARYING DIET

The children's diets were adequate as to calcium and phosphorus and well supplied with vitamins A and B. There did seem a possibility of their being low in vitamin C. Therefore, for 6 months enough orange juice to make up any possible deficiency (1 tablespoonful per child per day) was given to half the egg group and half of the orange group, again watching the children as closely as possible. The orange produced no observable change as regards height and weight, general condition of health, or hemoglobin percentage and erythrocyte count. Therefore, it seems fair to conclude that the diets were not inadequate in vitamin C, and that increasing it did not result in better iron utilization.

At the close of the two-year study 10 of the children who had been on the no-egg diet for a year or more (most of them the full 2 years) were made the subject of another study of the influence of diet on the iron in the blood, using

* A preliminary report on "The Influence of Prolonged Administration of Egg upon the Hemoglobin Content of Children's Blood" was presented before the American Society of Biological Chemists, December, 1925, and a full report of the whole experiment will be published soon.

10 of those who had been on the egg diet for a similar length of time as controls. Following suggestions made by Dr. F. S. Robscheit-Robbins as a result of her studies with Dr. G. H. Whipple on the influence of food on blood regeneration in animals made anemic by blood removal, each child received 3 times a week 1 ounce of calf's liver, giving the same amount of iron per week as the eggs. The experiment was continued 4 months, beginning in February and closing the first of June. The liver-fed children's blood iron, which had been falling in the preceding months, showed a distinct rise within a month, which continued another 2 months, after which there was a fall to a lower level. This was a different kind of effect from that produced by the egg. In the case of the latter, the rise was slow and subsequently maintained, indicating efficient utilization of the iron of the egg but no special stimulation of the blood-forming organs. In case of the liver, there seemed to be such a stimulation for a time, with a decrease in the effectiveness of the stimulus after several months. On the whole, the egg appears to be a very valuable reinforcement for the diet of the young child, even when the diet is not lacking in any known dietary essential.

DIET IN PERNICIOUS ANEMIA

WILLIAM P. MURPHY, M.D.

Medical Clinic of the Peter Bent Brigham Hospital, Boston, Massachusetts

ADVANCEMENT of knowledge in the realm of medicine has been rapid during the past few years due, very largely, to an ever increasing desire on the part of the medical profession to study medical problems more carefully. The study of the effect of a special food or of a special diet in health and in disease has led to an increasing tendency to the observance of a proper dietary régime which may supplement or even supplant other forms of therapy. It is now often possible to prevent or to relieve in this way such conditions as obesity, constipation, arthritis, scurvy, rickets, kidney disease, diabetes, sprue, pellagra, beriberi, and others. Among the more recent advances in the field of dietetics has been the successful treatment by means of a special diet of the disease known as pernicious anemia.

Pernicious anemia is a disease in which the red blood cells of the body are destroyed by an unknown factor, and to such an extent that the person so affected may in a short period of time have only a small fraction of the usual number of red blood cells in the body. The blood may then increase spontaneously or following some form of treatment so that the amount of blood cells again approaches normal. Following either the first or a subsequent drop in the red blood cell count the disease has in the past been fatal because of a failure to stop the blood destruction and to stimulate blood formation.

CHECKING PERNICIOUS ANEMIA

It is now possible by the use of certain foods to very quickly stop this process of blood destruction and to instigate a rapid regeneration of red blood cells until in most instances a normal number will again be present in the body. Such a change has been brought about in all of a rather large series of cases treated by this means during a period of 3 years during which time it has been possible to keep the blood at an essentially normal level, providing the patient has continued to partake of the diet.

The diet which is effective and which has been described in detail elsewhere[1, 2] consists of the following foods:

Liver (calves' or beef) is given daily in relatively large amounts. As an occasional variation chicken livers, lamb's kidneys or sweetbreads may be allowed.

Fruit, especially that containing the lower per cent of sugar is given at least twice daily, and should be used in place of the sweet desserts.

Vegetables make up the very large bulk of the diet, especially the green types, such as spinach, lettuce and young string beans. Several rather large helpings of these should be taken daily. Corn, parsnips, baked and shell beans are to be avoided.

In addition to the liver a similar and fairly large amount of muscle meat is advocated. This may be beef as broiled steak, roast, or Hamburger steak, or lamb as chops or roast. Pork and the fat of other meat should be avoided.

Of the starchy types of food, crisp or dry breads are allowed, made preferably of the coarser flours as wholewheat or graham. No soggy or hot breads or muffins are allowed.

Cereals may be taken for breakfast, and either potato, rice, macaroni, spaghetti or noodles may be taken once daily.

One egg and one glass of milk may be taken daily if desired.

All fried and fatty food is avoided, except that a very moderate amount of butter and cream may be used in order to make the diet palatable.

All grossly sweet food is to be avoided with the exception of two or three teaspoonfuls of sugar daily, and such simple desserts as custard or jello.

The liver and the muscle meat should be eaten rather rare and may be cooked in various ways in order to make it palatable and appetizing; but it should not be fried or prepared with fat. The liver is usually very satisfactorily cooked by broiling or baking it.

Salt or seasoning should be used sparingly as in many other types of diet.

Although the diet as we have described it seems to be a very simple one our experience during the past few years has led us to conclude that the most satisfactory results will be obtained only when it is administered properly, and is eaten faithfully by the patient.

Pernicious anemia is prone to occur in more than one member of a family group, is most prevalent in individuals of a certain physical type, and in those who have certain abnormalities of their digestive system. It is quite possible that the development of this disease could be prevented if one were to eat a diet throughout life somewhat similar to the one described. Such a régime should be even more important for those individuals who may be considered as belonging to the group described as being especially susceptible to the development of this condition.

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1. Minot, George R., and Murphy, William P. Treatment of Pernicious Anemia by a Special Diet. *Jour. A. M. A.*, 87:470–476 (Aug. 14), 1926.

2. Murphy, William P., and Minot, George R. A Special Diet for Patients with Pernicious Anemia. *Boston M. & S. J.*, 195:410–411 (Aug. 26), 1926.

Relation of Iron from Various Sources to Nutritional Anemia—Observations in this paper were made on extremely anemic rats before and after the addition of equal quantities of iron from widely varying sources, with the purpose of comparing availability. The anemic condition of the animals was not produced by hemorrhage but was of a nutritional origin. A true nutritional anemia can be produced in rats raised from parents that have been fed on diets low in iron.

In order to make a comparison of the availability rather than quantity of iron in each source, the amounts of each supplement fed have been so calculated as to furnish as nearly as possible 0.4 mg. of iron daily. This quantity daily was chosen as enough to promote a rapid rise in hemoglobin when well utilized but was not enough to blot out finer distinctions in availability.

Iron from food and other organic sources showed availability as follows:

Very good—Molasses, meat, and ovoferrin.

Good—Egg yolk and spinach.

Uncertain because of incomplete consumption—Raisins and dates.

Of inorganic sources tested a definite line of differentiation occurred between the soluble and insoluble salts as regards their availability in the animal organism as follows:

Very good—Ferric chloride and ferric ammonium citrate.

Poor—Ferric oxide and ferrous carbonate.

It is suggested in view of these observations, that a new line of differentiation be drawn as regards availability of iron in the animal organs, *i.e.*, soluble versus insoluble rather than organic versus inorganic.—H. S. Mitchell and L. Schmidt, *J. Biol. Chem.*, Oct., 1926.

Effect of Nutrition on Mental Growth—A study was made on a group of public school children in Alabama. The group included 61 children (37 boys and 24 girls) selected from grades 4, 5, and 6.

The 7 per cent or more underweight for height and age composed the experimental group (25 in all) and the others were used as the control group. Physical defects were not corrected in the underweight group and the only set of factors changed was the diet. Special instructions were given to the experimental group in health and food habits.

Gain in weight was used as the measure of physical progress. National Intelligence Tests Scale A was used to determine mental progress. Both groups equalled the expected gain in weight and the underweight group exceeded it and the gain of the control group. Gain in mental age in the control group was:

14.1 months for the boys
13.5 months for the girls.

On the underweight group the gains were

9.3 months for the boys
9.2 months for the girls.

Authors conclude that while it is possible, over a period of 5 months to secure gains in weight exceeding the expected gain with underweight children having physical defects there is not a corresponding gain in mental age, when this gain is measured against the gains of children in that same class who are not underweight. They, therefore, conclude that the assumption that improved nutrition as measured by a gain in weight will bring about improved mentality is not yet proved.—Annie J. Smith and Ada M. Field, *J. Home Econ.*, Dec., 1926.

Blood **Regeneration in Severe Anemia**—Experiments were conducted with anemic dogs. The condition of severe anemia was produced by 2 or 3 large hemorrhages so that the hemoglobin level was reduced 40 or 50 per cent and it was maintained at this level by frequent bleedings:

Results of feeding were as follows:

Beef liver feeding is associated with maximal regeneration of hemoglobin and red cells. There is indication that liver is concerned with pigment construction.

Beef heart feeding is less favorable to hemoglobin and red cell regeneration when compared with liver.

Beef muscle (lean beef) is less favorable than beef heart.

Green vegetables, under conditions of severe anemia, are only moderately favorable, good factors for the regeneration of hemoglobin and red cells.

Spinach and beet greens appear to be very slightly more potent than lettuce and asparagus. The presence of large amounts of these vegetables in the diet modify only very slightly the hemoglobin and red cell construction.—G. H. Whipple and F. S. Robscheit-Robbins, *Am. J. Physiol.*, 1926.

Loss of Mineral and Other Constituents by Various Methods of Cooking—Sixteen vegetables were studied to determine the loss to dry matter, crude protein, calcium magnesium, phosphorus, and iron by 4 methods of cooking: steaming, pressure cooking, boiling in a moderate quantity of water and boiling in double this volume of water. The losses increase for the different methods in the order named, the least occurring when the vegetable is steamed and the greatest when it is boiled in an excess of water.

The average losses for dry matter and crude protein were 15 per cent by steaming and pressure cooking; 30 per cent by boiling in a moderate quantity of water, and 40 per cent when double the volume of water was used.

For calcium the losses were 10 per cent for steaming and pressure cooking, and 20 and 30 per cent for 2 methods of boiling.

For magnesium the losses were 20 per cent for steaming and pressure cooking and 30 and 45 per cent for boiling.

The losses for phosphorus and iron were the same as for magnesium except by the 2 methods of boiling where figures were 5 to 10 per cent higher. The loss of iron is greater than any of the 4 elements. Beet greens, cabbage and spinach lose much iron through cooking processes.

Cabbage loses many of its food constituents while cauliflower retains them. Celery, beet greens, and onions lose mineral elements particularly. Spinach retains its calcium well.—W. H. Peterson and C. S. Hoppert, *J. Home Econ.*, May, 1925.

Iron Content of Meats—The iron content of muscle meat from different parts of the carcass showed a marked similarity. The organ meats were much richer in iron indicating that greater use might well be made of these parts as human foods.

Beef spleen, liver, kidney and blood contain more iron than do vegetable foods.

Beef and veal contain $^2/_3$ more iron than do pork and lamb and 10 times as much iron as does milk.

Beef heart and brain contain twice as much iron as do beef and veal.

Beef liver contains about twice as much iron as does beef heart.

Beef spleen contains about ½ as much iron as does beef liver.

There is twice as much iron in beef as in potatoes; 2½ times as much iron in beef as in white flour and cornmeal; and 8 times as much iron in beef as in apples.

Peas, beans, lentils, graham flour, oatmeal, shredded wheat and spinach contain more iron than does beef.—E. B. Forbes and Raymond W. Swift, Penn. State College, *J. Biol. Chem.*, Feb., 1926.

EDUCATION AND PUBLICITY

EVART G. ROUTZAHN *

FEBRUARY—1927

1-28—Intensive Educational Campaign against Typhoid—Proposed by Conference of State and Provincial Health Authorities—Address: Any public health agency

1-28—Junior Red Cross topics: "Colds" (make warning posters); "Fair Working Hours for Our Bodies" (make up stories on regular sleep)

1—Poster Competition for National Hospital Day closes—Address: American Hospital Association, 18 East Division St., Chicago, Ill.

9—Roosevelt National Memorial Day

12—Abraham Lincoln's birthday

13—Race Relations Sunday—Address: Federal Council of Churches, 105 East 22d St., New York, N. Y.

13-19—National Drama Week. Address: Drama League of America, 59 East Van Buren Street, Chicago, Ill.

14—St. Valentine's Day

22—George Washington's birthday

METHODS AND PROBLEMS

Health and Sanitation bibliography in *Negro Year Book* 1925-1926. Health conditions and material to be utilized in health educational work. Negro Year Book Co., Tuskegee Institute, Ala.

Housing in Philadelphia, Philadelphia Housing Association. Report for 1925. Chapter on educational efforts to teach and arouse tenants and citizens.

How Advertising Helps Medicine Help the Public, by Morris Fishbein. *Printers Ink*. Aug. 19, 1926. "Medical profession's attitude toward advertising changes since clean-up." Author is editor of the *Journal of the American Medical Association*.

Milk—Men's Food, by Edith Hawley. *Hoosier Health Herald*, Indiana Tuberculosis Association. May, 1926. How the popular practice of serving milk in offices and factories is handled in one city.

Mouth-Conscious America, by Philip Wagner. *New Republic*. July 21, 1926. Ironic discussion of tooth paste and toothbrush advertising—"the humbuggery that surrounds the selling of mouth goods."

Pharmaceutical Doctors. *Weekly Bulletin*, Department of Health, New York City. July 31, 1926. The druggist who uses the title of "Doctor."

Red Cross Leadership in Warfare Against Disease, by C.-E. A. Winslow. *Red Cross Courier*, Washington, Oct. 1, 1926. Will help in fitting the local chapter into the community health program.

Three Problems That Confront the Small Hospitals, by C. A. Brimmer. *Modern Hospital*, Sept., 1926. One of the three is "public relations." A good point: "We always report (accident) cases promptly and give such details as are available. If, for some reason, it is advisable to refrain from printing anything about the case, we state our reasons at the time of giving the information and our confidence has never been violated."

Traffic Control at Street Inter-sections. *Travelers Standard*, Hartford, Conn. June, 1926. Illustrates need of simplicity and clarity in signal systems; illustrates wise use of pavement signs.

SLOGANS

"The Health of the People the Beginning of Happiness." Brookline, Mass., Board of Health.

"Let's Wipe Diphtheria Out of Racine!" Racine Health Department. Mimeographed in red across back of mimeographed weekly bulletin.

"Tuberculosis Is Curable If Treated Early." Municipal Tuberculosis Sanatorium, Chicago.

CAMPAIGNS

Baby Week in May's, Los Angeles. Infants' and Children's Department, 325 West Jackson Blvd., Chicago. Aug., 1926. For those who wish to coöperate with department stores.

* Please address questions, samples of printed matter, criticism of anything which appears herein, etc., to Evart G. Routzahn, 130 East 22d St., New York City.

Health Week in Great Britain, Oct. 3–10, 1926. National Baby Week Council, 117 Piccadilly, London, W. 1.

How 8,124 Contributors Brought Success to Deaconess Hospital Campaign, by A. G. Lohman. *Modern Hospital*, Aug., 1926. Service background; outline of the campaign.

The Preschool Drive. By Ellen S. Stadtmuller. *Weekly Bulletin*, California Board of Health, Sept. 4, 1926.

The third annual "Learn to Swim" week, held in 10 pools in and around Pittsburgh, Pa., was sponsored by *The Sun* in coöperation with the Pittsburgh Chapter and the recreation bureau of Pittsburgh. *Red Cross Courier*, Aug. 16, 1926.

PRESS COPY

He Who Laughs Last—*Health Bulletin*, North Carolina State Board of Health. Oct., 1926. 100-word incident illustrating value of smallpox vaccination.

A mine of rich statistical nuggets for publicity is *Statistical Report of Infant Mortality for 1925 in 697 Cities of the United States*. American Child Health Association, 370 Seventh Ave., New York. June, 1926. Free. Health officer or other health worker or interested editorial writer, you can compare your city or state with others of comparable population, or other cities of the state, etc. These comparisons can be texts for various lessons or appeals.

A 92-year-old "oldest member" has been discovered by the National Tuberculosis Association. Your oldest member may be good for a news story, or for honors in a convention or annual meeting.

"Safety and Health-Carriers," daily hints on hygiene and safety, are being supplied to newspapers of Holland by Dr. E. Waisvisz of Zaandam.—*Journal of Social Hygiene*. June 1926.

Some of the Best Things in Rural Virginia, by Wilson Gee. A bulletin of University of Virginia, Charlottesville. May, 1926. 20 cents. "The purpose . . . is to assemble some of the outstanding institutions and agencies in rural Virginia . . . that within certain reasonable limits are practicable for many of the other rural communities of the state." Includes description of two hospitals and the Halifax County Health Department. A newspaper editor may be interested in the idea of a feature article or series of articles on "the best things" in your state.

Thousands of newspaper editors recently read the following "hunch" in *Editor and Publisher:* "With school starting, parents will begin their annual worrying over the possibility of epidemics of measles, diphtheria, etc. Interview your health officer and get his suggestions on methods of preventing such epidemics." This is hoping that we were ready for the editor—or even that we anticipated the opportunity by early proposing to the editor that the health department and the newspaper coöperate. Please tell the editor of this department what you did in this direction.

MOTION PICTURES

Under this heading new films, in so far as they come to our attention, will be announced as a matter of news. It is to be hoped that evaluation will follow through the National Health Council, or the respective national health agencies.

Two successes in producing "talking" motion pictures have been launched recently. The "Vitaphone" is probably too elaborate, and too expensive to be considered by health agencies. The "Phonofilm" promises to be within reach of health workers where a "talking" picture would be effective. The editor will forward requests for information.

Motion Pictures—Pro and Con, by H. E. Kleinschmidt. *Bulletin*, National Tuberculosis Association. Oct., 1926. Free. Advantages and Disadvantages, with practical suggestions for those who use them.

Program of Motion Picture Films Shown at the A.P.H.A. meeting Buffalo. A memorandum giving synopsis, producer, price, etc., for each of 10 pictures. National Health Council, 370 Seventh Ave., New York. Free.

"Condemned," of the animated cartoon type on the prevention of diphtheria by the use of toxin-antitoxin. 200 feet, less than 4 minutes. Produced by New York State Department of Health.

"A film dealing with the importance of general medical examinations once a year for every adult has just been completed," by American Medical Films, 350 Madison Ave., New York.

"The exceptionally valuable instructional film produced by Col. L. W. Harrison, on the Manifestations, Diagnosis and Treatment of Syphilis, is now complete except for the section on Congenital Syphilis." British Social Hygiene Council.

"Youth and Life is also on instructional lines, and is intended to illustrate a course of

lectures for parents, teachers, or adolescent groups." In four sections: Our Bodies, Our Minds, Growing Up (with adaptations for youths, and for girls), Looking Forward. Synopsis in *Health and Empire*, 10 Orange St., Leicester Square, London, W. C. 2. June, 1926. 2s. 6d.

"Thumbs Up," Institute for Crippled and Disabled Men, 245 East 23rd St., New York. "One of the most unusual and inspiring pictures of true bravery ever made."

PEOPLE

The titles to be listed under this heading may help us—in getting folks to wear rubbers to avoid pneumonia, for instance.

How Did We Get That Way? by James Harvey Robinson. *Harpers*. Aug., 1926. About ourselves—and others.

The New Decadents: Babbitt Starts to Reform, by Duncan Aikman. *Harpers*. Sept., 1926. Luncheon clubs and community service.

Where Do We Get Our Prejudices? by Robert L. Duffus. *Harpers*. Sept., 1926. Helps us understand ourselves—and other people.

ETHICS

Ethical Problems, *American Journal of Nursing*—A department. "The Editor and the Committee on Ethical Standards will be glad to consider other solutions than those offered each month to the ethical problems submitted for discussion. They will welcome additional problems."

Would that health education and publicity workers, and others engaged in public health, could submit problems in ethics to this department, or to the Public Health Education Section, Philip S. Platt, chairman, 370 Seventh Ave., New York.

"New Ways for Old"—This new "one reel historical health film tells a dramatic story about real people. It might easily be the history of every family in your audience. It shows three generations in the struggle against diphtheria and the final victory which science has won for the child to-day. The message which the modern Betty Adams' mother hears over the radio will interest every parent.

"While New Ways For Old carries the special message of diphtheria prevention, it has general interest for any audience because the depicted developments in the care of diphtheria are typical of the progress of medicine.

"The haircloth trunk, an heirloom for generations in a New England family, the doctor's buggy used during the Civil War, the original first bottle of antitoxin which saved the lives of children in Providence—these are a few of the properties which contribute to the unusual background for the story.

"A variety of publicity helps are available through the Metropolitan Life Insurance Company. Dodgers advertising any theatrical showings of this film in connection with the regular program will be distributed on request by local Metropolitan representatives. Posters will be furnished for display purposes. 'Protect Your Child Against Diphtheria,' a leaflet telling what toxin-antitoxin means for the child's health and happiness will be sent for free distribution. News stories for local papers will be supplied on request. Speech outlines for local speakers in case there is an opportunity to explain how your town can protect its children against diphtheria."

Open Air Sleeping Window Display—"'When you're tucked in for the night, you will breathe the crisp air and awaken thoroughly refreshed,' read a sign in a window display set up by the Douglas County Chapter at Arcola, Ill., to arouse closed-window sleepers to the value of fresh air, even when the mercury is down to zero. The display was arranged in the window of an empty store by Miss Esta L. Will, public health nurse. It represented a bedroom, comfortably furnished, with the figure of a sleeper in the bed, upon which was piled plenty of warm woolen blankets. A concealed electric fan furnished the breeze that moved the curtains of the open window at the back. Posters declaring the advantages of fresh air decorated the walls. The room was so invitingly arranged that it won many converts to the idea that sleeping in the fresh air, however frosty, was a pleasure as well as health giving."—*Red Cross Courier*. May 15, 1926.

LAW AND LEGISLATION

JAMES A. TOBEY, LL.B.

SO much material on public health law and legislation has turned up since the preparation of this section for last month's issue that the special articles promised on how to revise health ordinances and what disease reports should be considered legally acceptable will be deferred until later numbers of the JOURNAL.

Congress Reconvenes—The Second Session of the Sixty-ninth Congress convened according to law on the first Monday in December and will remain in session until March 4. During this short period it seems unlikely that pending public health legislation will get much consideration, though there will probably be a fight in the Senate over the extension of the Federal Maternity and Infancy Act. The Senate may spend much of its valuable time in consideration of the numerous charges that some of its newly elected members were a little too lavish in the use of money to secure the great honor of a seat in this august body. Consideration by the Senate of how to spend more effectively appropriations for federal health activities will probably not be on the calendar, though it is conceivable that the public welfare would be greatly enhanced by a real determination in this respect.

Among the measures of interest to sanitarians which will be theoretically before this session are the Parker bill (H.R. 10125) for the correlation of federal health work; the bill (H.R. 11768) for the regulation of imported milk, which has passed the House; bills for the control of narcotics, oil pollution, and lye; a bill to prohibit vivisection; bills for the promotion of rural hygiene, for a national institute of health; and a number of health measures for the District of Columbia, particularly an excellent school hygiene bill.

The Federal Maternity and Infancy Act—The bill (H.R. 7555) to extend the provisions of the Federal Maternity and Infancy Act for a 2-year period has passed the House, and has been reported in the Senate, though with an amendment reducing the period of extension to one year. The *Journal of the American Medical Association* has in its issue of November 22, 1926, one of its usual editorials condemning this measure, with a clarion call for a check on "Sheppard-Townerism." A description of some of the accomplishments during the 4 years' operation of the law is presented in the *Nation's Health* for November, 1926, by Dr. B. M. Haines and Miss E. T. Marsh of the Children's Bureau. Among organizations which have passed resolutions favoring extension of the act are the American Child Health Association and the American Public Health Association. The U. S. Children's Bureau in a news story released November 15, 1926, alleges that nearly 1,000,000 babies and preschool children, and approximately 180,000 expectant mothers were reached during the fiscal year 1926 by the national program carried on in the 43 states under the Sheppard-Towner law, which the American Medical Association considers so iniquitous. The Children's Bureau further announces that 2,313 of the 2,826 counties in these states have been reached by the program.

The administration of this law for the fiscal year 1925 is presented in full in the recent publication No. 156 of the Children's Bureau. Persons interested in an impartial general discussion of this whole matter will find it in the monograph on the Children's Bureau and the book on the national government and public health, both issued by the Institute for Government Research of Washington, D. C., and obtainable through the book service of the A.P.H.A.

Government Health Work—Descriptions of federal health activities have lately become fashionable, which is a good thing, for the more publicity given to this phase of governmental activities, the better. The *United States Daily*, a privately owned daily newspaper published in the Capital, sent out a circular letter on November 11, 1926, announcing a series of articles on

federal health. In it they say: "Public Health is the most important subject in our country"—a sentiment with which all sanitarians will agree. They also assert that there are "more than sixty bureaus, sections, units, divisions, in addition to the Public Health Service, doing research and actively working in the field to promote health." Forty is the number reported in the *National Government and Public Health.*

"What the Government Is Doing for Tuberculous Persons" is described in *Public Health Reports* for October 29, 1926, by Lucy Minnegerode. This is the complete paper, portions of which were given in the *American Journal of Nursing* for September, 1926, and commented upon in this department in the November JOURNAL. The *Catholic Charities Review*, published in Washington, D. C., will have an article entitled "Uncle Sam and Public Health" in an early issue. The publishing firm Harper & Bros. has a book on federal health in press as one of its health series. The more the merrier, because the more attention given to this topic, the more likely we are eventually to get some action on it.

U. S. Supreme Court Decisions—Three recent decisions of the United States Supreme Court are of special interest to sanitarians. These are the opinions sustaining the prohibition law with respect to liquor prescriptions, upholding zoning, and sanctioning the transfer of foreign drug patents to the Alien Property Custodian.

By a court divided five to four, the federal dry law limiting prescriptions of whisky by physicians to one pint every ten days per patient was upheld on November 29, 1926. This cause arose out of a suit by Dr. Samuel Lambert of New York, who sought to enjoin prohibition officials from enforcing the law. He lost his suit in the lower federal courts and appealed to the Supreme Court. The American Medical Association supported Dr. Lambert in his contention that this was federal interference with the practice of medicine, and submitted a brief in the case. In the opinion delivered by Justice Brandeis, with the concurrence of Chief Justice Taft and Justices Holmes, Van Devanter, and Sanford, it is stated that Congress had made a determination in this matter after due consideration, and under the Eighteenth Amendment had authority to legislate regarding it. The dissenting opinion claims, however, that medical practice is exclusively a matter for state regulation and that restriction of physicians in writing prescriptions is not within the purview of federal legislation.

The zoning decision was handed down on November 22, 1926, in a case which came up from the federal court in Ohio. A zoning ordinance was upheld as a valid exercise of authority in the interests of the public welfare. The court suggested that segregation of residence, business, and industrial buildings increases the security of home life, tends to prevent street accidents, especially to children, decreases noise and other conditions which produce or intensify nervous disorders, and preserves a more favorable environment in which to rear the young. This opinion will be of value in helping to clarify the law on zoning, which often has an important public health aspect. In this respect attention is invited to an article on zoning as a health measure, which appears in the *Nation's Health* for October, 1926. It is an abstract of testimony given by Dr. George M. Kober in a case on zoning tried in the Supreme Court of the District of Columbia.

The decision with regard to American drugs is dated October 11, 1926, and sustains the purchase by the Chemical Foundation of sundry German patents. This is of much importance to medicine and pharmacy, as it insures a supply of reliable drugs from American sources.

A Basic Sanitary Code—Fundamental principles for the control of communicable diseases are presented in a practical manner for use in legal requirements in the *Boston Medical and Surgical Journal* for November 11, 1926 (page 935). This material comes at the end of a series of articles on the control of communicable diseases in Massachusetts written by Dr. Edward G. Huber for the Committee on Public Health of the Massachusetts Medical Society. The entire set will be published together and may be obtained from that journal. In his suggested basic sanitary code, Dr. Huber outlines the diseases which should be reported, the methods of reporting, duties of local health officers, isolation and quarantine for specific diseases, methods and enforcement of isolation and quarantine including contacts and carriers, rules for food handlers, concurrent and terminal disinfection, and various miscellaneous matters. Actual phraseology for a code is not given, the requirements merely being indicated. This material is well worked out and should be useful to anyone interested in making or revising a sanitary code.

Cooperation in Milk Regulation—The representatives of six contiguous states met in New York City on November 4, 1926, to discuss possibilities of adopting standard regulations for the control of milk. The states concerned are Connecticut, Massachusetts, New Jersey, Pennsylvania, New York, and Vermont, all of which, together with New York City, obtain milk from common sources, or ship milk from one state to the other. The New York State Committee appointed to redraft milk regulations will harmonize its code with the ideas produced by this conference.

A draft of a bill to require all milk in Massachusetts to come from tuberculin tested cattle unless it is to be pasteurized, is given in the *Boston Medical and Surgical Journal* for November 18, 1926 (page 1,011), together with a discussion of this proposition. The bill will be introduced in the next session of the legislature.

Liability for Typhoid—A review of court decisions on liability for typhoid fever contracted from public or private water supplies is given in the report of the Committee on Cross Connections of the Conference of State Sanitary Engineers. This is abstracted in the *American City* for November, 1926. These decisions have also been described in the *American Water Works Handbook*.

A suit against the City of Albany has been won by a plaintiff whose son contracted typhoid from drinking polluted city water, according to *Health News* of the New York State Department of Health for November 8, 1926. Counsel for the city announced that this decision of the Supreme Court would be appealed to the higher courts of the state.

Tuberculosis and Working Conditions—A person who knowingly and wilfully continues to work in an insanitary place cannot recover damages for sickness induced by the environment, according to a recent decision of the Appellate Division of the New York Supreme Court (Wager vs. White Star Candy Co., 217 N. Y. Supp. 173). In this case a woman contracted tuberculosis as a result of working for six months in a damp, insanitary, unventilated cellar. She sued her employer and was awarded $2,000 in the lower court. On appeal it was claimed that the matter was one for the workmen's compensation laws. This contention was rejected by the court on the ground that the disease was not an accident within the meaning of the statute. The court further held that there could be no recovery because plaintiff was aware of the insanitary conditions and voluntarily submitted to them. This is in line with the doctrine of contributory negligence in the law of torts. An employer is, however, required to furnish his employes with safe and sanitary working conditions. If this case is appealed, it will be interesting to see what is the outcome.

A somewhat similar case, with respect to the workmen's compensation phase, has recently been adjudicated in Texas, Aetna Life Insurance Company vs. Graham, 284 S. W. 931. Here a woman contracted tuberculosis as a result of continued exposure to gases, fumes, etc., incident to her work in a shoe polish manufacturing company. The Commission of Appeals recommended that this be not considered an accident and that judgment be entered denying compensation. This recommendation was accepted by the Supreme Court and judgment so entered.

If this be the law at present in New York and Texas, the respective legislatures should take immediate steps to remedy the situation and protect the health of their workers by adequate legislation.

Pan American Conference of Directors of Health—The report of the deliberations of the first conference of national health directors of the Pan-American countries is given in *Public Health Reports* for November 12, 1926. This meeting was held last September in Washington, D. C., and was attended by representatives from sixteen countries. Among the recommendations adopted were a number of suggested modifications for the Pan-American Sanitary Code and a resolution to the effect that all health and social welfare activities should be centralized in ministries or departments of health. It was further decided to recommend to the various governments the establishment of ministries of health, social welfare, and labor, where these do not already exist. It will be interesting to see what action, if any, the government of the United States will take on this proposal. It already has a Department of Labor.

CONVENTIONS

This calendar is published through the coöperation of the National Health Council, 370 Seventh Avenue, New York City.

Jan. 19–21, American Society of Civil Engineers, New York, N. Y.

Jan. 21–22, American Social Hygiene Association, New York, N. Y.

Jan. 26–28, American Society of Heating and Ventilating Engineers, St. Louis, Mo.

Feb. 13–20, Pan-American Child Congress, Havana, Cuba.

Feb. 14–17, Council on Medical Education and Hospitals of the American Medical Association, Chicago, Ill.

Feb. 15–16, Federation of State Medical Boards of United States, Chicago, Ill.

Feb. 21–25, American College of Physicians, Cleveland, O.

Feb. 23–26, National Association of Deans of Women, Dallas, Tex.

Feb. 24–26, National Vocational Guidance Association, Dallas, Tex.

Feb. 26–March 3, The Department of Superintendence of the National Education Association of the United States, Dallas, Tex.

Horlick's *the Original* Malted Milk

In the Diet of School Children

READJUSTMENT of habits and function follows the end of vacation and the return to school. Freedom of mind and body are surrendered to the restrictions of class room and study hour. Sunshine, fresh air and out-door exercise are interfered with. The system needs recompense for the inhibitions of school life.

HORLICK'S MALTED MILK offers a solution to the dietetic problems of adolescent youth. It provides the five basic food elements (fats, proteins, carbohydrates, minerals and vitamins) in proper proportions. It satisfies the youthful craving for sweets without burdening digestion with harmful ingredients.

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AMERICA'S CHILDREN

Keep their lithe young bodies straight and strong!

THOUSANDS of children, apparently in the best of health, are not really getting the nourishment they need. This is the reason why periodic examinations by a physician are so valuable. The doctor can often detect a tendency toward malnutrition and take immediate steps to build up bodily vigor and resistance. Fresh air and sunshine, plenty of rest and sleep are insisted upon. A properly balanced diet is laid out and commonly the regular taking of Cod-Liver Oil is suggested. Cod-Liver Oil is recognized as the most abundant source of the fat-soluble vitamins "A" and "D."

As your physician knows, every bottle of Parke, Davis & Co.'s Standardized Cod-Liver Oil bears a statement which no other cod-liver oil on the market bears, as to the number of units of *both* Vitamin "A" and Vitamin "D" contained in each fluid-ounce of the product.

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